

FLORA DA RESERVA DUCKE, AMAZONAS, BRASIL: CHRYSOBALANACEAE

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Trees, shrubs (or rarely suffrutices in cerrado). **Leaves** alternate, simple, with entire margins, sometimes with ant domatia at base (*Hirtella*) petioles often with two glands or glands inserted at base of lamina. Stipules present (often early caducous), either axillary or inserted on base of petiole. **Flowers** borne in racemes, panicles or less frequently in cymes or fascicles. Receptacle lined by a nectariferous disk. Bracts and bracteoles with stalked or sessile glands in some species of *Hirtella*, otherwise eglandular. Calyx lobes 5, imbricate, often glandular (*Hirtella* and *Couepia longipendula*). Petals 5, usually white or purple in colour, imbricate. Style arising from base of ovule, filiform. Ovary inserted at base (*Chrysobalanus*, *Licania*) or mouth of receptacle (other Ducke genera), usually unilocular with 2 ovules, or bilocular with one ovule in each loculus in *Parinari* and *Exellodendron*. Ovules erect, epitropous, with micropyle directed towards base. **Fruit** a dry or fleshy drupe, usually one seeded rarely 2 seeded. **Seed** almost exalbuminous, cotyledons planoconvex, fleshy.

The family consists of 18 genera and 531 species which are distributed around the tropics. Seven genera are neotropical. Five genera occur within Reserva Ducke and a sixth (*Exellodendron*) is common in the vicinity of Manaus, but occurs more frequently, although not exclusively in igapó forest.

Hirtella is mainly a genus of shrubs and treelets of the understory although two large tree species occur in Reserva Ducke. The other four genera *Chrysobalanus*, *Couepia*, *Licania* and *Parinari* are all trees in Reserva Ducke. Fifty-one species of Chrysobalanaceae have been collected in Reserva Ducke, and two more which are expected to occur are included in this account.

The wood of Chrysobalanaceae is little-used because of the quantity of silica (see ter Welle 1986), however, some species are used for marine and river posts because of their resistance to attack by aquatic organisms. The fruit of *Couepia longipendula* produces an edible oil and used to be cultivated for it in the region of Manaus. Various other non Ducke Reserve species also produce comestible oils. *Couepia bracteosa* (known locally as Pajurá) is frequently encountered in the markets in the vicinity of Manaus and the fruits of several other species such as *Parinari excelsa* are also edible.

The genus *Couepia* is predominantly pollinated by moths with the exception of bat-pollinated *Couepia longipendula* whereas the closely related *Hirtella* is pollinated mainly by butterflies. The genera *Licania* and *Parinari* are mainly bee pollinated.

Until recently the Chrysobalanaceae has been placed near or within the Rosaceae in most major systems of classification. A possible relationship closer to the Theales seems more likely in light of recent molecular studies.

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Key to Genera of Chrysobalanaceae of Reserva Ducke

1. Ovary inserted at base of receptacle.
 2. Stamens exerted and united to mid length, filaments hairy, endocarp longitudinally costate *Chrysobalanus*
 - 2'. Stamens if united and hairy then included, endocarp rarely costate *Licania*
- 1'. Ovary inserted at mouth of receptacle.
 3. Stamens included, ovary bilocular *Parinari*
 - 3'. Stamens exerted, ovary unilocular.
 4. Stamens 3-9, fruit with thin bony endocarp *Hirtella*
 - 4'. Stamens 14-100, fruit with hard endocarp *Couepia*

This key is to the five genera known to occur in Reserva Ducke. A sixth genus common in the vicinity of Manaus is *Exellodendron*. It would key out to *Parinari* in the above key. *Exellodendron* differs from *Parinari* in the leaves without stomatal cavities which are either glabrous or lanate-pubescent, and the fruit with a smooth not lenticellate epicarp and a smooth non-ridged thin bony endocarp.

Table 1 - Characters for separation of the genera of the Reserva Ducke and of *Exellodendron*

	<i>Chrysobalanus</i>	<i>Couepia</i>	<i>Hirtella</i>	<i>Licania</i>	<i>Parinari</i>	<i>Exellodendron</i>
Stamen position	exserted	exserted	exserted or included	exserted	included	included
Stamen number	14-15	14-100	3-9	3-40	6-8	6-8
Ovary & fruit	unilocular	unilocular	unilocular	unilocular	bilocular	bilocular
Ovary position	basal	unilateral	unilateral	basal	unilateral	unilateral
Leaf pubescence	glabrous	glabrous, lanate	glabrous, hirsute	glabrous, hirsute, lanate, pulverulent stomatal cavities	stomatal cavities	glabrous or lanate
Fruit	hard endocarp with longitudinal ridges	hard endocarp	thin bony endocarp splitting longitudinally	various, usually hard endocarp	hard endocarp with 2 basal stoppers	thin bony endocarp without stoppers
Petal colour	white	white (rose in <i>C. longipendula</i>)	purple to white	white or apetalous	white	white

Key to the species of Chrysobalanaceae of Reserva Ducke

1. Leaf base with myrmecophilous swellings, plants hispid.
 2. Inflorescence fasciculate (in bunches).
 3. Stamens 4-5; leaves 9-19 cm long, coriaceous, the lower surface bullate when dry *Hirtella myrmecophila*
 - 3'. Stamens 6-7; leaves 17-30 cm long, membraneous, the lower surface not bullate .
..... *Hirtella physophora*
 - 2'. Inflorescence an elongate raceme *Hirtella duckei*
- 1'. Leaf base without myrmecophilous swellings, rarely hispid.
 4. Leaves glabrous or with sparse hispid-hirsute hairs only beneath.
 5. Young stems hispid.
 6. Leaves thin, membraneous, 3.5-7.5 x 1.5-3.8 cm; oblong; petals white
..... *Hirtella rodriguesii*
 - 6'. Leaves subcoriaceous, 5.5-15 x 2.2-5 cm, elliptic to oblong; petals purplish-pink
..... *Hirtella hispidula*
 - 5'. Young stems not hispid; glabrous, puberulous or lanate.

7. Leaf base usually subcordate, leaves obviously oblong with nearly parallel margins *Licania oblongifolia*
- 7'. Leaf base rounded to subcuneate, leaves tapering with margins not parallel, except in *L. macrophylla*.
8. Leaves with sparse to dense hirsute-hispid pubescence beneath.
9. Leaves oblong-elliptic; primary veins 9–10 pairs; stamens 7–9, united for $\frac{1}{2}$ length; inflorescence and flowers sparsely hirsutulous *Licania hirsuta*
- 9'. Leaves broad and ovate; primary veins 12–20 pairs; stamens, free to base; inflorescence and flowers densely tomentose *Licania latifolia*
- 8'. Leaves glabrous or with a few sparse appressed hairs beneath.
10. Leaves oblong-lanceolate, 13–40 × 4.5–10.5 cm, the margins parallel for most of their length *Licania macrophylla*
- 10'. Leaves elliptic to oblong, up to 16 cm long, usually much less, the margins tapering not parallel.
11. Inflorescence flagelliflorous, suspended on a long peduncle 30–70 cm long; fruit egg-shaped, hard woody endocarp, 4–6 cm long *Couepia longipendula*
- 11'. Inflorescence not flagelliflorous, fruit usually globose or ovoid rarely with a woody endocarp.
12. Leaves with caudate to cuspidate apex.
13. Stamens 7–15; filaments included or little exerted, hairy, united for half length.
14. Stamens 14–15; filaments slightly exerted; inflorescence of few-flowered cymules; endocarp ridged *Chrysobalanus venezuelanus*
- 14'. Stamens 7–8; filaments included; inflorescence a panicle of racemes; endocarp smooth *Licania caudata*
- 13'. Stamens 3–5; filaments far exerted, glabrous, free *Hirtella bicornis*
- 12'. Leaves acuminate or rounded but never cuspidate.
15. Stamens exerted beyond calyx lobes, often more than 10
16. Petals absent *Licania apetala*
- 16'. Petals present.
17. Stamens 13–16.
18. Leaves elliptic or ovate 6–16 × 3, 5–6.8 cm; petioles with 2 sessile glands *Licania unguiculata*
- 18'. Leaves obovate, 4.5–8.5 × 2–4 cm; petals not unguiculate; petioles eglandular *Licania egleri*
- 17'. Stamens 3–8.
19. Inflorescence a raceme; stamens 6–8; leaves oblong to oblong-lanceolate; bracteoles with 2 sessile glands at base *Hirtella racemosa*
- 19'. Inflorescence slightly branched panicle or a fascicle; stamens 3–4; bracteoles eglandular or with few sessile glands.
20. Inflorescence fasciculate; leaves elliptic, 9–12.5 × 5–6.5 cm *Hirtella fasciculata*
- 20'. Inflorescence a panicle; leaves oblong, 3.5–9 × 1.4–3.2 cm *Hirtella piresii*
- 15'. Stamens shorter than calyx lobes, 5–7.
21. Leaf apex rounded, retuse or only acute; leaves 3–11 cm long.

22. Petioles 7–9 mm long with two prominent subopposite glands at middle *Licania sothersiae*
- 22'. Petioles 2–6 mm long, eglandular or with two glands at junction with lamina
23. With two glands at junction with petiole and lamina, petioles glabrous; fruit globose, epicarp pubescent not ridged *Licania heteromorpha*
- 23'. Petiole eglandular, pubescent; fruit oblong, epicarp glabrous, weakly ridged *Licania prismatocarpa*
- 21'. Leaf apex acuminate; leaves (6–)8–24 cm long.
24. Fruit oblong-ovoid, longitudinally costate, exocarp glabrous; leaf secondary venation prominently reticulate on both surfaces *Licania reticulata*
- 24'. Fruit oblong-ovoid or globose, not costate, exocarp glabrous or short-ferruginous-tomentellous; secondary venation of leaf smooth not conspicuously reticulate.
25. Fruit oblong-ovoid, 6–8 cm long, exocarp glabrous; inflorescence densely brown-tomentose, flowers borne on primary branches of inflorescence *Licania laevigata*
- 25'. Fruit globose, 1.5–2.5 cm diameter, exocarp with short-ferruginous tomentum; inflorescence sparsely puberulous; flowers borne in few-flowered cymules on short secondary branches of inflorescence *Licania adolphoduckei*
- 4'. Leaf underside with continuous lanate or pulverulent covering or with stomatal cavities filled with hairs.
26. Leaf underside with stomatal cavities or deeply reticulate so that pubescence is hard to remove.
27. Stipules adnate to base of petiole and persistent; petals always absent.
28. Midrib impressed above for entire length.
29. Stomatal cavities extremely conspicuous because of glabrous nervation; leaves elliptic 3–8 cm broad; petioles eglandular *Licania bracteata*
- 29'. Stomatal cavities not so obvious because some hairs on nervation; leaves oblong lanceolate, 1.8–4 cm broad, petioles glandular *Licania impressa*
- 28'. Midrib plain above at least on upper half; petioles glandular *Licania pallida*
- 27'. Stipules axillary (often caducous).
30. Primary leaf veins 21–32 pairs; midrib impressed for entire length.
31. Leaves 9–17 cm long; petioles with two pairs of glands; flowers 6–9 mm long; primary veins more than 3 mm apart *Parinari montana*
- 31'. Leaves 2–7.5 cm long; petioles usually without distinct glands; flowers 5–6 mm long; primary veins 1–2 mm apart *Parinari parvifolia*
- 30'. Primary leaf veins 6–20 pairs; midrib usually plane or prominulous above (except in *Licania laxiflora*).
32. Leaf apex rounded, leaves orbicular *Licania sandwithii*
- 32'. Leaf apex acute, leaves oblong to elliptic.
33. Petals present.
34. Filaments not exceeding calyx-lobes; ovary bilocular; fruit hard and woody, petioles glandular *Parinari excelsa*
- 34'. Filaments exceeding calyx-lobes; ovary unilocular; fruit normally soft; petioles glandular only in *C. racemosa*.
35. Inflorescence branched *Couepia racemosa*
- 35'. Inflorescence a simple unbranched raceme.
36. Inflorescence with short silver-grey pubescence; fruit exterior glabrous, lenticellate; leaves 4–7 × 2.5–3 cm *Couepia elata*



- 36'. Inflorescence with dense ferruginous pubescence; fruit exterior shortly ferruginous pubescent; leaves 5–18 × 1.7–8 cm.
37. Leaf acumen 5.5–18 mm long; receptacle long and slender, 11–22 mm long *Couepia parillo*
- 37'. Leaf acumen 1–12 mm long; receptacle short and thick 3–10 mm long *Couepia canomensis*
- 33'. Petals absent.
38. Midrib slightly impressed above, leaves reticulate but without stomatal cavities; stamens included, 6–8 *Licania laxiflora*
- 38'. Midrib prominent above; leaves with conspicuous stomatal cavities beneath; stamens far exserted, 9–12.
39. Flowers borne in small cymules and short secondary branches of inflorescence 2–5 mm long *Licania sprucei*
- 39'. Flowers solitary on primary branches of inflorescence.
40. Leaf reticulation extremely prominent above when dry; fruit exterior appressed-yellow-sordid pubescent leaves 8–23 × 3.5–1 cm *Licania longistyla*
- 40'. Leaf venation prominulous on upper surface; fruit exterior glabrous; leaves 3–12 × 2–4 cm *Licania octandra*
- 26'. Leaves either pulverulent or lanate pubescent beneath, the pubescence usually easily removed due to lack of deep reticulations.
41. Leaf undersurface pulverulent (powdery) furfuraceous pubescent; stipules adnate to base of petiole.
42. Leaves coriaceous, the apex rounded to acute, the margins slightly revolute *Licania coriacea*
- 42'. Leaves chartaceous, the apex acuminate, the margins not revolute.
43. Stipules axillary, caducous; lower surface of lamina with 2 distinct glands at junction with petiole; stamens exserted ca. 14 *Licania lata*
- 43'. Stipules adnate to base of petiole, lamina without glands at junction with petiole; stamens 3–5, included.
44. Petioles glandular, stamens 3; calyx-tube urceolate *Licania niloi*
- 44'. Petioles eglandular; stamens 5; calyx-tube campanulate.
45. Leaves 2.5–9 × 0.8–4 cm; inflorescence with flowers in groups on short secondary branches *Licania hypoleuca*
- 45'. Leaves 4.5–13 × 2–5.5 cm; flowers sessile inserted on primary inflorescence branches *Licania canescens*
- 41'. Leaf undersurface lanate pubescent (not powdery); stipules usually axillary (except in *L. gracilipes* and *L. micrantha*).
46. Primary leaf veins 5–7, widely spaced; stamens 3–5 included.
47. Stamens 5, leaf underside dark ferruginous pubescent; stipules axillary *Licania rodriguesii*
- 47'. Stamens 3; leaf underside grey to brown pubescent; stipules usually inserted at base of petiole *Licania micrantha*
- 46'. Primary leaf veins 8–25, often crowded; stamens 15–50, exserted 3 and included in *L. gracilipes*)
48. Stipules adnate to base of petioles; stamens 3, included *Licania gracilipes*
- 48'. Stipules axillary; stamens 15–50, exserted.
49. Leaves obovate, 4–10 × 2.5 cm, chartaceous *Couepia obovata*
- 49'. Leaves not obovate, usually longer and thickly coriaceous (except in *C. ulei*).

50. Leaves grey pubescent beneath, not ferruginous.
51. Leaves 5–10 × 2, 5–4, 5 cm, elliptic, calyx densely pubescent on exterior; fruit exterior lenticellate *Couepia ulei*
- 51'. Leaves 9–25 × 3–7 cm oblong-lanceolate; fruit not lenticellate.
52. Leaves 9–16 × 3–5 cm, primary veins 10–15 pairs; receptacle and calyx sparsely pubescent on exterior not forming complete covering *Couepia guianensis* subsp. *guianensis*
- 52'. Leaves 13–25 × 4–7 cm; primary veins 23–28 pairs; receptacle and calyx densely pubescent on exterior *Couepia excelsa*
- 50'. Leaves ferruginous or at least brown pubescent beneath.
53. Inflorescence a raceme.
54. Bracteoles persistent and $\frac{3}{4}$ length of receptacle; leaves 6–13 cm long, brown pubescent beneath *Couepia habranthia*
- 54'. Bracteoles caducous, much shorter than receptacle; leaves 14–24 cm long, rufous brown pubescent beneath *Couepia magnoliifolia*
- 53'. Inflorescence a branched panicle.
55. Leaves 6–12 × 2.5–2.5 cm *Couepia guianensis* subsp. *divaricata*
- 55'. Leaves 9–24 cm long.
56. Bracteoles equalling calyx and persistent; leaves 9–23 × 4–11 cm; stipules 1, 5–3, 5 mm *Couepia bracteosa*
- 56'. Bracteoles shorter than calyx and caducous; leaves 8–22 × 4–9.5 cm; stipules 4–5 mm *Couepia robusta*

1. *Chrysobalanus*

Chrysobalanus L., Sp. Pl. 1: 513. 1753.

Shrubs or small trees with hermaphrodite flowers. **Leaves** entire, glabrous or with few stiff appressed hairs beneath, with two or more glands at base of lamina. Bracts and bracteoles eglandular. **Inflorescences** terminal or axillary small cymules. Receptacle cupuliform, the interior and exterior puberulous. Calyx lobes 5, acute. Petals 5, longer than calyx lobes. Stamens 12–26, arranged in complete or nearly complete circle; filaments hairy, united at the base for part of length. Ovary inserted at base of the receptacle, densely pilose; carpel unilocular, ovules 2. **Fruit** a small fleshy drupe; epicarp smooth, ridged when dry; endocarp hard, thin, glabrous within, with 4–8 prominent longitudinal ridges which correspond to the lines of fracture that allow the seedling to escape. **Type species:** *Chrysobalanus icaco* L. The name is derived from the Greek for golden fruit on account of the yellow fruit of the type species.

Tropical Africa and America mainly in coastal areas. One species inland and occurring in Venezuela and the vicinity of Manaus including Reserva Ducke.

1.1 *Chrysobalanus venezuelanus* Prance, Fl. Neotrop. Suppl. 9S: 4. 1989.

Trees to 10 m tall, the young branches sparsely appressed puberulous. **Leaves** oblong-elliptic to oblong, coriaceous, 5.5–11 × 2.2–4.2 cm, cuneate at base, caudate at apex, the acumens 10–17 mm long, glabrous and shiny above, glabrous beneath except for appressed hairs on midrib and primary veins, with two pairs of conspicuous glands near base beneath; midrib prominulous above, prominent beneath; primary veins 6–8 pairs, widely spaced, prominulous on both surfaces; petioles 2–4 mm long, terete, rugulose, appressed pubescent when young. Stipules axillary, caducous. **Inflorescences** of few-flowered cymules inserted on short rachis to 5 mm long, the rachis and branches ferruginous-pubescent; bracts and bracteoles ovate, membranous, puberulous on exterior, the cymules subtended by two large bracts. **Flowers** 3 mm long. Receptacle campanulate, tomentellous on exterior, tomentose within; calyx lobes rounded, tomentellous. Petals 5, ovate, white, glabrous. Stamens 14–15, inserted around complete circle, the filaments shortly exerted,

pubescent. Ovary lanate. Style equalling filaments in length. **Fruit** oblong, 2–2.3 cm long, fleshy, the epicarp dark bluish-purple, with sparse short-hairs, costate when dry, but not when fresh.

Type: VENEZUELA. BOLÍVAR: *Bernardi* 2777 (fl) (holotype NY; isotype NY).

Known only from Bolívar State in Eastern Venezuela and recently also collected in Reserva Ducke. Forest on terra firme.

17.XII.1996 (fl) *Sothers, C. A. & Silva, C. F.* 962 (INPA K MG MONY RB SPU).

This poorly known species was thought to be confined to Venezuela. The Ducke collection shows that it obviously has a much wider distribution. The new material has also enabled a full description of the fruit for the first time.

2. *Couepia*

Couepia Aubl., Pl. Guiane 1: 519, t. 207. 1775.

Trees or **shrubs** with hermaphroditic flowers 7–40 mm long. **Leaves** entire, usually glabrous above, glabrous or with dense lanate or arachnoid very rarely hirsute indumentum beneath. Petioles with two sessile glands or eglandular, often canaliculate. Bracts and bracteoles eglandular. **Inflorescences** axillary or terminal panicles or racemes. Receptacle cylindrical to turbinate, but with much variation in shape and size, rarely flattened, usually hollow, the base within commonly glabrous (rarely hairy), with deflexed hairs at mouth, tomentose to glabrous on exterior. Calyx lobes acute or rounded, often reflexed. Stamens 14–100, most often in a complete circle, less frequently unilateral with staminodes opposite them; filaments exceeding the calyx lobes, usually much entwined to form a tangled mass. Ovary inserted laterally at mouth of receptacle; carpels unilocular. **Fruit** a hard or fleshy drupe, with a verrucose, smooth or tomentose epicarp; endocarp hard and roughish, with a characteristically granular exterior, breaking up in an irregular manner on germination. Germination hypogeal, the first leaves alternate. **Type species:** *Couepia guianensis* Aubl. The name *Couepia* is derived from the vernacular name in French Guiana.

Mexico and Central America, Colombia, Ecuador, through the Guianas and Amazonia to southern Brazil. Thirteen species occur or are likely to occur in the Reserva Ducke.

2.1 *Couepia bracteosa* Benth., Jour. Bot. (Hooker) 2: 215. 1840.

Trees to 20 m tall, usually smaller, without buttresses, outer bark with shallow vertical fissures giving a wrinkled appearance. **Bark** fragile and crumbling, slash pinkish-red, exuding reddish translucent sap. **Leaves** ovate-elliptic, 8–22 × 4–9.5 cm, subcordate at base, short-acuminate at apex, glabrous above, gray to brown-lanate beneath; midrib prominulous above, prominent beneath; primary veins 12–25 pairs, prominent beneath; petioles 8–18 mm long, terete or weakly canaliculate, eglandular, sparsely pubescent, shallowly canaliculate. Stipules 1.5–3.5 mm long, subulate, deciduous. **Inflorescences** terminal panicles with short silver-gray pubescence. Bracts ovate, often exceeding the receptacle tube, enclosing small groups of buds, 7–12 mm long, persistent. Receptacle subsessile, cylindrical, 7–12.5 mm long, densely brown-pubescent on exterior, glabrous within except for deflexed hairs at throat. Calyx lobes acute. Petals 5, white, sparsely ciliate on margins. Stamens 25–40, connate at base of filaments, inserted in an arc of 270°, with a few short filamentous staminodes opposite them. Ovary densely villous. Style pubescent. **Fruit** globose, 8 cm long, 7 cm broad; epicarp verrucose or smooth; mesocarp thick and fleshy; endocarp thin and rather fragile, granular, glabrous within.

Type: GUYANA. *Schomburgk* 485 (fl) (holotype K; isotypes BM CGEGH L OXF TCD).

Primary and secondary forest on terra firme in the Guianas and Amazonian Brazil.

Fruit edible, known as pajurá.

23.II.1995 (fr) *Nascimento, J. R. et al.* 760 (INPA K MG MONY RB SPU); 23.XI.1993 (fl) *Ribeiro, J. E. L. S. et al.* 1167 (INPA K MG MONY SP); 21.XII.1994 (fl) *Ribeiro, J. E. L. S. et al.* 1550 (G INPA K MBM MG R U UB US); 1.XII.1977 (fl) *Silva, M. F. et al.* 2230 (INPA).

2.2 *Couepia canomensis* (Mart.) Benth. ex Hook. f., in Mart. Fl. bras. 14(2): 42. 1867.

Moquilea canomensis Mart., Nov. Gen. Sp. Pl. 2: 80. 1827.

Shrubs or small trees to 12 m tall without buttresses. **Bark** with thin longitudinal irregular fissures; slash pinkish-brown, no exudate. **Leaves** ovate to oblong-elliptic, 8.5–18 × 3–8 cm, rounded to subcuneate at base, short-acuminate at apex, with acumen 2.5–12 mm long, glabrous above, prominently reticulate beneath with short gray-brown pubescence between reticulations; primary veins 10–15 pairs, prominent beneath, slightly impressed above; midrib impressed and usually pubescent above; petioles 6–11 mm long, terete, eglandular, with dense ferrugineous pubescence. Stipules 3–8 mm long, linear, persistent. **Inflorescences** densely-flowered axillary racemes, the rachis and branches ferrugineous-hirtellous. Bracts and bracteoles 2.5–7 mm long, persistent. Receptacle subcampanulate-cylindrical, 5.5–10 mm long, dense ferrugineous-brown pubescent on exterior, glabrous within except for deflexed hairs at throat; pedicels ca. 1 mm long. Calyx lobes acute, hirsute on exterior. Petals 5, white, glabrous on margins. Stamens 40–51, inserted in a nearly complete circle, with a short row of toothed staminodes opposite them. Ovary densely villous. Style pubescent at base only. **Fruit** round to oblong, 3.5–5 cm long, 2.5–3.5 cm broad; epicarp short-velutinous; endocarp thin, fragile, granular, sparsely-pubescent within.

Type: BRAZIL. AMAZONAS: *Martius s.n.* (fl fr) (holotype M st; isotypes BR K).

Primary and secondary forest and clearings on terra firme in western and central Amazonia and southern Guyana.

18.VII.1996 (fl) *Assunção, P. A. C. L. et al.* 349 (INPA K MG MONY SP); 15.VII.1997 (fl) *Assunção, P. A. C. L.* 538A (K); 7.VII.1994 (fl) *Hopkins, M. J. G. et al.* 1438 (INPA K MG MONY RB SPU); 7.VII.1994 (fr) *Hopkins, M. J. G. et al.* 1447 (INPA K MG MONY RB SP); 24.I.1995 (fr) *Nascimento, J. R. & Silva, C. F.* 710 (INPA K MG MONY R RB SPU); 9.VI.1976 (st) *Oliveira, A. R. de s/u* INPA59908 (INPA); 14.XII.1966 (fr) *Prance, G. T. et al.* 3633 (INPA); 19.X.1961 (fl) *Rodrigues, W. & Lima, J.* 2686 (INPA); 17.VII.1963

(fl) *Rodrigues, W.* 5367 (INPA); 8.VII.1964 (fl) *Rodrigues, W. & Loureiro, A.* 5937 (INPA); 6.XII.1966 (fr) *Rodrigues, W. & Monteiro, O. P.* 8281 (INPA); 6.XI.1997 (fr) *Souza, M. A. D. et al.* 450 (BM G INPA K MBM MG UB US); 3.XII.1997 (fr) *Souza, M. A. D. et al.* 467 (IAN INPA K NY UEC).

2.3 *Couepia elata* Ducke, Arch. Inst. Biol. Veg. 2: 35. 1935.

Large trees to 35 m tall, not buttressed. **Bark** with narrow longitudinal fissures 2–5 mm deep; slash reddish on outer part, dark brown within, no exudate. **Leaves** ovate 4–7 cm long, 2.5–3 cm broad, obtuse to subcuneate at base, caudately acuminate at apex, with acumen 6–9 mm long, glabrous above, prominently reticulate beneath with silvery-gray pubescence between reticulations; midrib impressed above, prominent beneath, pubescent on lower portion; primary veins 6–8 pairs, prominent beneath; petioles 4–6 mm long, terete, eglandular, shortly pubescent. Stipules minute. **Inflorescences** terminal and axillary few-flowered lax racemes, with short gray-pubescence. Bracts and bracteoles minute, caducous. Receptacle obconical-turbinate, 4–5 mm long, sparsely pubescent on exterior, glabrous within except for deflexed hairs at throat; pedicels 2.5–3.5 mm long. Calyx lobes acute. Petals 5, white, glabrous on margins, deciduous. Stamens 35–40, inserted in half a circle, with a row of short-toothed staminodes opposite them. Ovary densely villous. Style glabrous except at base. **Fruit** globose, 5–6 cm diameter; epicarp densely verrucose; mesocarp thick; endocarp fragile, thick, granular.

Type: BRAZIL. AMAZONAS: *Ducke RB 25001* (fr) (holotype RB; isotypes K P U).

Terra firme forest in the lower Rio Negro region of Brazil. Flowering March to June.

28.V.1997 (fl) *Assunção, P. A. C. L. et al.* 506 (INPA K MG MONY R RB SPU); 28.V.1997 (fl) *Assunção, P. A. C. L. et al.* 507 (BM G IAN INPA K MBM UB UEC US); 31.X.1997 (fr) *Assunção, P. A. C. L. & Silva, C. F.* 708 (INPA K NY); 30.III.1966 (st) *Coêlho, L. s.n.* INPA5248 (INPA); 22.VI.1965 (fl) *Loureiro, A. & Coêlho, D. s/u* INPA15532 (INPA); 2.VI.1964 (fl) *Rodrigues, W. & Loureiro, A.* 5830 (INPA); 9.VII.1965 (fl) *Rodrigues, W. & Monteiro, O. P.* 6962 (INPA);

29.III.1966 (fr) *Rodrigues, W. & Monteiro O. P.* 7638 (INPA); 3.XI.1997 (fr) *Souza, M. A. D. et al.* 449 (IANINPA K MORB SP U).

2.4 *Couepia excelsa* Ducke, Arch. Jard. Bot. Rio de Janeiro 5: 116. 1930.

Trees to 25 m tall. **Leaves** elliptic to oblong-lanceolate, 13–25 × 4–7 cm, rounded to subcordate at base, acuminate at apex, with acumen 4–9 mm long, sparsely appressed-pubescent above, becoming glabrous with age, densely gray-arachnoid beneath; midrib prominulous and sparsely pubescent above; primary veins 23–28 pairs, prominent on lower surface; petioles 8–10.5 mm long, terete, eglandular pubescent. **Stipules** to 3 mm long, caducous. **Inflorescences** short-branched panicles or racemes, axillary or terminal, 3–6 cm long, the rachis and branches brown tomentellous. **Bracts** and bracteoles, ovate, to 8 mm long, caducous. **Receptacle** subcampanulate, 9 mm long, densely brown-pubescent on exterior, the interior lined to base by dense reflexed hairs; **pedicels** 2–3 mm long. **Calyx lobes** rounded, ovate, 4.5–6 mm long. **Petals** 5, white, ciliate on margins. **Stamens** 38–40, inserted in an arc 270°, sometimes with a short sterile toothed portion of circle opposite them. **Ovary** villous. **Style** pubescent almost to apex. **Fruit** oval, 6–7 cm long, 4 cm broad; epicarp smooth, glabrous; endocarp granular, fragile, glabrous within.

Type: BRAZIL. PARÁ: *Ducke s.n.* (fl) (holotype RB19758; isotypes, IAN K P U).

Terra firme forest in eastern Amazonian Brazil. Flowering July to October.

Not yet collected in Reserva Ducke, but likely to occur.

2.5 *Couepia guianensis* Aubl., Hist. Pl. Guiane 1: 519, t. 207. 1775.

Trees to 30 m tall, without buttresses. **Twigs** puberulous, soon becoming glabrous. **Leaf lamina** oblong to oblong-lanceolate, membranous to coriaceous, 4.5–16.5 × 2.5–5.5 cm, rounded to subcuneate at base, acuminate at apex, the acumen 5–18 mm long, glabrous above, densely gray- to brown-lanate, or glabrous, or with a sparse caducous pubescence beneath, frequently with two glands at junction with petiole; primary veins 10–15 pairs, plane above, prominent beneath; midrib prominulous above, prominent beneath; petioles 3–9 mm long, canaliculate above, eglandular, pubescent when young, becoming glabrous and rugose with age. **Stipules** 1–3 mm long, linear, early caducous. **Inflorescences** terminal and axillary little-branched panicles or racemes, the rachis and branches sparsely puberulous to glabrous. **Bracts** and bracteoles minute, membranous, ovate, caducous. **Receptacle** cylindrical to subcampanulate, 4.5–10(–12) mm long, 1–2.5 mm broad below calyx, sparsely puberulous to glabrous externally, glabrous within except for deflexed hairs around throat; **pedicels** 0.5–4 mm long. **Calyx lobes** five, rounded, 2–2.5 mm long, puberulous or glabrous externally. **Petals** five, white, ciliate. **Stamens** 14–30, unilateral, inserted around half of a circle with short staminodes opposite them. **Ovary** villous. **Style** pubescent for at least half its length. **Fruit** rounded to ovoid, 3–4 cm long, 2.5–3 cm broad; exocarp smooth, glabrous; mesocarp thin, fleshy; endocarp thin, fragile, granular in texture, glabrous within.

Type: FRENCH GUIANA. *Aublet s.n.* (lectotype BM).

Key to subspecies of *Couepia guianensis*

1. Inflorescences of racemes (rarely with a few short branches bearing 2 flowers), usually in at least 3 axils below the apex of branch; leaf lamina 9–16.3 cm long, chartaceous; petioles 6–9 mm long, receptacle always narrowly cylindrical. Plants of terra firme *Couepia guianensis* subsp. *guianensis*
- 1'. Inflorescences of panicles, usually only 1 or 2 axils per apex; leaf lamina 5–10.5 cm long, coriaceous or chartaceous; petioles 3–6 mm long; receptacle cylindrical or subcampanulate. Plants of terra firme or flooded river banks.
 2. Leaves chartaceous, the underside glabrous or sparsely pubescent, plants of flooded river banks *Couepia guianensis* subsp. *glandulosa*
 - 2'. Leaves thickly coriaceous, the underside densely lanate-pubescent, plants of terra firme ..
..... *Couepia guianensis* subsp. *divaricata*

2.5a *Couepia guianensis* subsp. *guianensis*
Couepia leptostachya Benth. ex Hook. f.,
in Mart. Fl. bras. 14(2): 44. 1867.

Trees with crumbling, wrinkled lightly fissured bark to 1 mm deep; inner bark dark brown outside, red within and with bands of red exudate near centre. **Leaf** lamina chartaceous, 9–16.3 cm long, the lower surface densely lanate-pubescent; petioles 6–9 mm long. **Inflorescence** mainly of terminal axillary racemes, usually in several axils below the apex, a few with short branches bearing two or three flowers. Receptacle 7–12 mm long, always narrowly cylindrical. Plants of terra firme.

7.VII.1994 (fl) *Hopkins, M. J. G. et al. 1439* (INPA K MG NY SP); 7.VII.1994 (fl) *Hopkins, M. J. G. 1442* (INPA K MG MONY RB SP); 28.VI.1994 (fl) *Nascimento, J. R. & Pereira, E. C. 518* (INPA K MG MO NY RB SP U); 6.VII.1994 (fl) *Nascimento, J. R. et al. 527* (INPA K MG NY SP); 12.XII.1968 (fr) *Prance, G. T. et al. 9038* (INPA); 17.VI.1994 (fl) *Rauos, J. F. & Silva, C. F. 2852* (INPA K MG MONY RB SP); 5.VI.1993 (fl) *Ribeiro, J. E. L. S. et al. 878* (INPA K MG NY).

2.5b *Couepia guianensis* subsp. *glandulosa*
(Miq.) Prance, Brittonia 33: 350. 1981.

Couepia glandulosa Miq., Stirp. Surinam. Select. 28. 1851.

Trees with crumbling erratically fissured bark; inner bark red, with copious red exudate. **Leaf** lamina chartaceous to thinly coriaceous, 5–10.5 cm long, the lower surface glabrous or sparsely lanate-pubescent; petioles 3–6 mm long. **Inflorescences** of terminal and axillary panicles with small few-flowered branches, in only one or two axils below the apex of branch. Receptacle 5–10 mm, subcampanulate to narrowly cylindrical. Plants of flooded river banks. 22.VI.1994 (fl) *Vicentini, A. & Assunção, P. A. C. L. 578* (INPA K MG MO NY RB SP).

2.5c *Couepia guianensis* subsp. *divaricata*
(Huber) Prance, Brittonia 33: 351. 1981. Fig. 104.

Couepia divaricata Huber, Bol. Mus. Paraense Hist. Nat. 6: 75. 1910.

Trees with smooth unfissured bark; inner bark pale brown, without red exudate. **Leaf** lamina coriaceous, 6–10.5 cm long, the lower surface densely lanate-pubescent; petioles 3–

6 mm long. **Inflorescences** of terminal and axillary panicles with small few-flowered branches in only one or two axils below the apex of branch. Receptacle 5–7 mm long, cylindrical. Plants of terra firme.

29.VII.1994 (fl) *Hopkins, M. J. G. & Silva, C. F. 1470A* (INPA K MG MO NY RB SP U); 3.VIII.1994 (fl) *Ribeiro, J. E. L. S. & Silva, C. F. 1375* (INPA K MG MONY RB SP U).

2.6 *Couepia habrantha* Standl., Field Mus. Nat. Hist., Bot. Ser. 17: 249. 1937.

Trees to 12 m tall. **Leaves** oblong-elliptic, 6–13 cm long, 2.5–6 cm broad, cuneate to rounded at base, acuminate at apex, with acumen 4–14 mm long, glabrous above, densely reddish-brown to grey-arachnoid beneath; midrib prominent and glabrous on upper surface; primary veins 11–15 pairs, prominent beneath; petioles 5–8 mm long, canaliculate above. Stipules to 2 mm long, caducous. **Inflorescences** short, dense, axillary and terminal spikes, the rachis with ferruginous-brown pubescence. Bracts and bracteoles 7–9 mm long, ovate, acute, deciduous. Receptacle subsessile, subcylindrical, 8–10 mm long, densely ferruginous-sericeous on exterior, glabrous within except for deflexed hairs at throat. Calyx lobes rounded. Petals 5, white, ciliate on margins. Stamens ca. 25, inserted in a semicircle, with short filamentous staminodes opposite them. Style densely pubescent for three fourths its length. Ovary pilose. **Fruit** ellipsoid; epicarp smooth, glabrous; mesocarp thin, fleshy; pericarp thin, fibrous and fragile, glabrous within. **Type:** BRAZIL. AMAZONAS: *Krukoff 7252* (fl) (holotype F; isotypes ABMBRIAN K MONY U US).

Terra firme forest in Guyana and central Amazonian Brazil. Flowering December to May. 9.III.1995 (fr) *Nascimento, J. R. et al. 783* (INPA K MGRU).

2.7 *Couepia longipeudula* Pilg., Notizbl. Konigl. Bot. Gart. Berlin 6: 141-142. 1914.

Trees 5–30 m tall, unbuttressed but trunk sometimes slightly swollen at base. **Bark** rather smooth and with irregular plaques in some places; outer bark paper thin with green layer

within; inner bark dark red with streaks of white, sap transparent. Wood smelling strongly of beans. **Leaves** oblong-elliptic, 6–16 × 3–7.5 cm, rounded to cuneate at base, caudately acuminate at apex, with acumen 1–1.5 cm long, glabrous on both surfaces, primary veins 5–8 pairs, almost plane; petioles 4–8 mm long, shallowly canaliculate, eglandular, glabrous. Stipules lanceolate, to 3 mm long, persistent. **Inflorescences** pendulous panicles on long (to 60 cm) peduncles, mostly glabrous but sparsely pubescent towards apex. Bracts and bracteoles 1–3 mm long, apiculate, caducous. Receptacle turbinate, 10–15 mm long, with short light brown pubescence on exterior, completely glabrous within. Calyx lobes rounded, with two sessile glands on exterior. Petals 5, rose, caducous, ciliate on margins. Stamens ca. 32, inserted in a nearly complete circle, with a few toothed staminodes interspersed on distal side opposite ovary; filaments purple. Ovary densely villous. Style glabrous, flattened at base. **Fruit** round to ellipsoid, 4–6 cm long, 4 cm broad; epicarp with short sparse brown pubescence; pericarp hard, thick, fibrous, not differentiated, densely lanate within. **Type:** BRAZIL, AMAZONAS: *Ule 8854* (fl) (holotype B lost; lectotype K; isolectotypes L LA MG).

Terra firme forest in the lower and upper Rio Negro region of Brazil. Flowering August to November.

18.II.1998 (fr) *Assunção, P. A. C. L. & Pereira, E. C. 791* (INPA K MG MO NY RB SP); 7.III.1968 (fr) *Coelho, L. & Coelho, D. s.n.* (INPA21129); 12.XII.1967 (fr) *Elias, J. 424* (INPA); 27.XII.1967 (fr) *Elias, J. 428* (INPA); 19.II.1957 (fr) *Ferreira, 57-1* (INPA); 20.XI.1964 (fl) *Loureiro, A. & Rodrigues, W. 6757* (INPA); 58.XI.1994 (fl) *Nascimento, J. R. 627* (INPA K MG); 5.VII.1993 (fl) *Ribeiro, J. E. L. S. et al. 1035* (INPA K MG MO NY RB SP U); 11.I.1966 (fr) *Rodrigues, W. & Monteiro, O. P. 7392* (INPA); 23.III.1966 (fr) *Rodrigues, W. & Coelho, D. 7605* (INPA); 6.XI.1994 (bd) *Sotlers, C. A. & Nascimento, J. R. 263* (INPA K MG).

The cotyledons of the fruit can be pressed to produce a comestible oil that is sometimes used locally. The name of this species is Castanha de galinha. The flowers are bat pollinated (see Vogel 1968; 1969).

2.8 *Couepia magnoliifolia* Benth. ex Hook. f., in Mart. Fl. bras. 14(2): 43. 1867.

Small to medium-sized trees. **Leaves** oblong, 14–24 × 5.5–8.5 cm, rounded to subcuneate at base, shortly acuminate at apex, with acumen 3–5 mm long, glabrous above, with dense rufous-brown arachnoid pubescence beneath; midrib prominulous above, prominent beneath; primary veins 15–18 pairs, prominent beneath, slightly impressed above; petioles 7–8 mm long, tomentose, eglandular etc. Stipules linear, to 1 mm long, membranous, caducous. **Inflorescences** dense axillary or terminal racemose spikes, the rachis ferruginous-brown-sericeous. Bracts ovate, 5–7 mm long, caducous. Receptacle subcylindrical, 8–9 mm long, ferruginous-sericeous on exterior, glabrous within except for deflexed hairs at throat; pedicels 1 mm long. Calyx lobes rounded. Petals 5, white, with ciliate margins. Stamens ca. 25, inserted in a complete circle. Ovary pilose. Style densely pubescent for three fourths its length. **Fruit** ellipsoid; epicarp smooth, glabrous; pericarp thick, fragile, glabrous within. **Type:** BRAZIL, AMAZONAS: *Spruce 1414* (fl) (holotype K; isotypes CGE FGH GOET LD LE NY OXFPRB).

Known only from terra firme forest in the vicinity of Manaus, Brazil. Flowering February to June.

VII.1997 (fl) *Forzza, R. C. et al. 293A* (INPA K MG NY); 14.IV.1998 (st) *Prance, G. T. et al. 30856* (K); 14.IV.1998 (fl) *Prance, G. T. et al. 30857* (INPA); 30.VI.1993 (fr) *Ribeiro, J. E. L. S. et al. 936* (INPA K MG MO NY SP).

2.9 *Couepia obovata* Ducke, Arch. Inst. Biol. Veg. 2: 35. 1935.

Small to medium-sized trees, unbuttressed. **Bark** slightly wrinkled but without fissures; inner bark reddish-brown, without exudate, smelling strongly of beans. **Leaves** obovate, 4–10 × 2–5 cm, subcuneate at base, bluntly acuminate at apex, with acumen 2–5 mm long, glabrous above, with a sparse covering of appressed gray hairs beneath; midrib prominulous above, prominent beneath; primary veins 8–10 pairs, prominent beneath; petioles 3–7 mm long, canaliculate, eglandular. Stipules 1–4 mm long,

lanceolate, caducous. **Inflorescences** terminal and axillary racemes, 3–6 cm long, the rachis with sparse silver-gray pubescence. Bracts and bracteoles 1.5–3.5 mm long, ovate, persistent. Receptacle cylindrical, 7–9 mm long, curved, with a few short appressed hairs on exterior, glabrous within except for deflexed hairs at throat, subsessile. Calyx lobes rounded. Petals 5, white, ciliate on margins. Stamens 16–21, inserted in a complete circle. Ovary lanate. Style glabrous except at base. **Fruit** ovoid, 2–3 cm long, 1.5–2.5 cm broad; epicarp smooth, glabrous; inconspicuously lenticellate; endocarp thick, hard, of a granular texture, glabrous within. **Type:** BRAZIL. AMAZONAS: *Ducke* (fl fr) (holotype RB24996; isotypes IAN K P U S).

Terra firme forest in the Guianas and central and Colombian Amazonia.

7.V.1957 (fr) *Albuquerque, B. W. P. s.n.* (INPA5566); 11.IX.1995 (fr) *Costa, M. A. S. & Assunção, P. A. C. L. 350* (INPA K MG MO NY R B S P U); 5.VI.1964 (fl) *Rodrigues, W. & Loureiro, A. 5832* (INPA); 3.VII.1967 (fl) *Souza, J. A. 38* (INPA); 23.V.1995 (fl) *Vicentini, A. 969* (INPA K MG MO NY R B S P U).

2.10 *Couepia parillo* DC., Prodr. 2: 526. 1825.

Trees to 20 m tall or shrub. **Leaves** oblong or oblong-elliptic, 5–15.5 cm long, 1.7–5.8 cm broad, acuminate at apex, with acumen 5.5–18 mm long, rounded to cuneate at base, glabrous above, prominently reticulate beneath, with silver-grey pubescence between the reticulations; midrib impressed and pubescent above; primary veins 10–15 pairs, prominent beneath, slightly impressed above; petioles 2–9 mm long. **Inflorescences** racemes of 5–21 flowers, the rachis and branches with ferruginous-brown pubescence. Stipules 1.5–5 mm long, linear. Bracts and bracteoles 2–6 mm long, linear, persistent. Receptacle slender, tubular, 11–22 mm long, with thick dense hirtellous pubescence, and some longer hairs on exterior, glabrous within or with hairs nearly to base of proximal side beneath ovary only; pedicels 1–3 mm long. Calyx lobes acute. Petals 5, white, glabrous on margins. Stamens 45–62, inserted almost in a complete circle, with a short

portion of toothed staminodes. Ovary densely villous. Style sparsely pubescent at base. **Fruit** globose, ca. 2.5 cm diameter; epicarp soft yellow-brown-velutinous; endocarp thin and fragile, granular in texture, sparsely hirsute within.

Type: FRENCH GUIANA. *Herb Ventenat s.n.* (fl) (holotype G).

Primary forest on terra firme, Savannas and secondary forest in the Guianas, Amazonian Peru and Colombia and the vicinity of Manaus. Flowering July to December.

19.VII.1997 (fl) *Forzza, R. C. 305* (IAN INPA K MO NY R B S P U UB); 1.X.1997 (st) *Mesquita, M. R. 18* (INPA K MG); 25.I.1996 (fr) *Souza, M. A. D. et al. 211* (K); 24.XI.1997 (fr) *Souza, M. A. D. et al. 460* (IAN INPA K NY SP).

2.11 *Couepia racemosa* Benth. ex Hook. f., in Mart. Fl. bras. 14(2): 43, t. 14. 1867.

Trees to 30 m tall, unbuttressed. **Bark** lenticellate; inner bark pinkish-brown, sap slightly white. **Leaves** elliptic to oblong, 5–18.5 × 2–7.5 cm, rounded to cuneate at base, acuminate at apex, with acumen 4.5–10 mm long, glabrous above, prominently reticulate beneath, or with stomatal cavities, with short appressed gray pubescence; midrib prominent beneath, slightly impressed above; primary veins 8–12 pairs, prominent beneath, slightly impressed above; petioles 8–12 mm long, terete or weakly canaliculate, with two sessile glands near to lamina base, eglandular, puberulous, glabrescent. Stipules ca. 1.5 mm long, caducous. **Inflorescences** little branched densely-flowered panicles, the rachis and branches with short brown tomentellous pubescence. Bracts and bracteoles ovate to oblong, 2–6 mm long, caducous. Receptacle cylindrical-turbinate, 5–7.5 mm long, with a short brown pubescence on exterior, glabrous within except for deflexed hairs at throat. Calyx lobes rounded to acute. Petals 5, white, exceeding calyx lobes, glabrous on margins. Stamens 24–30, unilateral, with a smooth glabrous untoothed portion of the circle opposite them. Ovary densely villous. Style pubescent at base only. **Fruit** elliptic, pointed at apex, 3–4.5 cm long, 2–3.5 cm broad; epicarp verrucose; pericarp undifferentiated, rather fragile, sparsely pubescent within.

Type: BRAZIL. AMAZONAS: *Spruce 1776* (fl) (lectotype, K; isolectotypes, OXF P).

Terra firme forest or on periodically flooded ground, riverine forest and river banks, and secondary forest in central and western Amazonia. Flowering February to August. Common around Manaus and most likely to occur in Reserva Ducke.

2.12 *Couepia robusta* Huber, Bol. Mus. Emilio Goeldi 6: 76. 1910.

Trees to 30 m tall, not buttressed or with small buttresses to 40 cm. **Bark** with narrow fissures giving wrinkled appearance, crumbling; inner bark reddish-brown with red exudate. **Leaves** oblong to elliptic, 9–23 × 4–11 cm, rounded to cordate at base, rounded or shortly acuminate at apex, with acumen 1–5 mm long, glabrous above, densely rufous-brown-araehnoid beneath; midrib prominent on both surfaces; primary veins 15–21 pairs, prominent beneath; petioles 5–8 mm long, canaliculate, eglandular, with short brown pubescence. Stipules to 5 mm long, lanceolate, caducous. **Inflorescences** terminal little-branched panicles, the rachis and branches with reddish-brown tomentum. Bracts and bracteoles 3–7 mm long, ovate, caducous. Receptacle subcampanulate, 7–9 mm long, densely reddish-brown-pubescent on exterior, glabrous within except for deflexed hairs at throat; pedicels 2 mm long. Calyx lobes rounded, 6–7 mm long, densely reddish-brown-pubescent on exterior, densely light-brown-pubescent within. Petals 5, white, ciliate on margins. Stamens ca. 43, inserted in an arc of ca. 240°, with a toothed ridge of staminodes opposite them. Ovary densely villous, often with two carpels developing. Style pubescent for half its length. **Fruit** ovoid, 5–6 cm long, 3.5–4 cm broad; epicarp smooth, glabrous; mesocarp thick, fleshy, fibrous; endocarp thin, fragile, granular, sparsely pubescent within.

Type: BRAZIL. PARÁ: *R.S. Rodrigues* (fl) (holotype MG9651; isotypes BM NY PRB U US).

Terra firme forest in Brazilian Amazonia. Flowering August to December.

9.III.1995 (fr) *Nascimento, J. R. et al. 783* (INPA K MG RU); 14.XII.1966 (fl) *Prance, G. T. et al. 3641* (INPA); 10.IX.1964 (fl) *Rodrigues, W. & Monteiro, O. P. 6034*

(INPA); 4.V.1965 (fl) *Rodrigues, W. & Monteiro, O. P. 6924* (INPA); 29.III.1966 (fr) *Rodrigues, W. & Coêlho, D. 7642* (INPA); 13.IX.1994 (bd) *Sothers, C. A. & Pereira, E. C. 167* (G INPA K MBM MG R U UB US); 26.IX.1994 (bd) *Sothers, C. A. et al. 171* (INPA K MG MONY RB SP); 26.IV.1968 (fr) *Souza, J. A. s.n.* (INPA21203); 8.X.1968 (fl) *Souza, J. A. 213* (INPA).

2.13 *Couepia ulei* Pilg., Verh. Bot. Vereins. Prov. Brandenburg 47: 149. 1905.

Trees to 15 m tall, or shrub. **Leaves** elliptic, 5–10.5 × 2.5–4.5 cm, rounded at base, acuminate at apex, with acumen 3–11 mm long, glabrous above, densely gray- to rufous-pubescent beneath; midrib prominent above, prominent beneath; primary veins 10–13 pairs, plane or slightly impressed above, prominent beneath; petioles 3–7 mm long, pubescent, shallowly canaliculate, eglandular. Stipules to 3 mm long, linear, caducous. **Inflorescences** terminal, little branched panicles, the rachis and branches with short gray-brown pubescence. Bracts and bracteoles 1–2 mm long, ovate, caducous. Receptacle subcylindrical, 5–7 mm long, shortly gray pubescent on the longitudinally striate exterior, glabrous within except for deflexed hairs at throat; pedicels 1–2 mm long. Calyx lobes rounded to acute. Petals 5, white, pubescent on exterior, ciliate on margins. Stamens ca. 35, inserted in a complete circle. Ovary villous. Style pubescent for half its length. **Fruit** elongate ellipsoid, 5 cm long, 2 cm broad; epicarp glabrous, verrucose; mesocarp fleshy, thin; endocarp thin, fragile, granular, densely pubescent within.

Type: BRAZIL. AMAZONAS: *Ule 5547* (fl) (holotype B, lost; lectotype K; isolectotypes INPA L MG RB).

Rivierine forest and terra firme forest in western and Central Amazonia. Flowering continuously.

7.VIII.1997 (fl) *Assunção, P. A. C. L. & Silva, C. F. 600* (BM G INPA K MBM MG UB UEC US); 9.IX.1997 (fr) *Assunção, P. A. C. L. & Pinheiro, Z. A. 640* (IAN INPA K MONY RB SPU UB); 21.VII.1963 (fl) *Rodrigues, W. 5445* (INPA); 29.VII.1965 (fl) *Rodrigues, W. & Monteiro, O. P. 6994* (INPA); 21.V.1997 (fl) *Sothers, C. A. et al. 992* (INPA K MG MO NY RB SP VEN); 6.VIII.1997 (fl) *Souza, M. A. D. et al. 393* (INPA K MG MONY RRB SP U).

3. *Hirtella*

Hirtella L., Sp. Pl.: 34. 1753.

Trees or **shrubs** with hermaphrodite flowers 3–11 mm long. **Leaves** entire, usually glabrous, or hirsute or with a few appressed hairs beneath, sometimes with two large bulbous myrmecophilous inflations at the junction of the lamina with the petiole. Petioles eglandular. Bracts and bracteoles commonly with few to many stalked or sessile glands, or eglandular, not enclosing the young flowers in small groups. **Inflorescences** panicles or elongate to fasciculate racemes, if paniculate then frequently racemoid or thyrsoïd, when branched the branches often bearing several sterile bracts and terminating with a single flower or a few cymosely arranged flowers. Receptacle usually campanulate, rarely elongate-cylindrical, hollow, usually glabrous inside at the base and with retrorse hairs at the throat, glabrous to tomentose or hispid on exterior, lined by a well-defined disc. Calyx lobes acute to rounded, usually reflexed. Stamens 3–9(–10), unilateral in most species, in a complete circle in two species, with staminodes present or absent; filaments usually far exceeding calyx lobes, rarely only slightly exceeding calyx lobes. Ovary of one unilocular carpel, inserted laterally at the mouth of the receptacle or less frequently midway up the receptacle; ovules 2. Style filiform, far exserted. **Fruit** a fleshy drupe, most often ellipsoid; epicarp smooth and glabrous or rarely densely tomentose; endocarp thin, hard, bony, exterior usually smooth to slightly channelled, hirsute within, usually with 4–7 lines of weakness which allow the seedling to escape. Germination hypogeal, the first leaves alternate.

Type species: *Hirtella americana* L. The name *Hirtella* is derived from the Latin *hirtus* = hairy. This refers to the hirsute pubescence of the leaves, young branches, and inflorescence of the type species.

Mexico and Central America. West Indies, Colombia, Ecuador, through the Guianas and Amazonia to Bolivia and Southern Brazil; also three species in East Africa and Madagascar.

3.1 *Hirtella bicornis* Mart. & Zucc., Abh. Math.-Phys. Cl. Konigl. Bayer. Akad. Wiss. 1: 377-378. 1832.

Trees to 25 m tall, or **shrubs**. Twigs puberulous to glabrescent, lenticellate. **Leaves** membranous to subcoriaceous, oblong to ovate, 3.5–9.5 × 1.7–4 cm, acuminate and often cuspidate at apex, with acumen 2–15 mm long, rounded to subcuneate at base, glabrous beneath or sparsely appressed-pubescent, the palisade glands few; primary veins 8–13 pairs, prominulous on both surfaces; midrib plane or nearly so above, prominent and glabrescent or puberulous beneath; petioles 0.5–3 mm long, terete, eglandular, puberulous when young. Stipules 1–3 mm long, lanceolate, tomentellous, eglandular, caducous. **Inflorescences** predominantly axillary panicles 1–4.5 cm long, the rachis and branches glabrescent to tomentellous. Bracts and bracteoles 1–2 mm long, acute, persistent, eglandular. **Flowers** 3–5 mm long. Receptacle campanulate, puberulous to glabrescent on exterior, glabrous within except at throat; pedicels 3–6 mm long. Calyx lobes acute, puberulous or glabrescent on exterior, gray-puberulous within. Petals 5, white, glabrous. Stamens 3–5, unilateral, the filaments glabrous, far exceeding calyx lobes. Style hirsute up to one third its length. Ovary inserted at mouth of receptacle, pilose. **Fruit** ellipsoid, the immature compressed longitudinally along center between apex and base, appearing two-chambered with two lobes at the extreme apex; epicarp smooth, glabrous; mesocarp thin, fleshy; endocarp thin, hard, bony, hirsute within.

Only one of the two varieties of this species occurs in Reserva Ducke.

Hirtella bicornis* var. *pubescens Ducke, Arch. Jard. Bot. Rio de Janeiro 3: 269. 1922.

Trees to 25 m tall, branch scars leaving prominent ridges on trunk, not buttressed. **Bark** smooth, unfissured but with hoop marks; inner bark reddish-brown, no exudate. **Leaves** usually oblong, usually cuspidate at apex, with acumen 7–15 mm long, thin, usually subcuneate at base; inflorescences usually tomentellous; large forest tree.

Type: BRAZIL. PARÁ: Ducke (fl) (holotype MG15299; isotype BM P).

Terra firme forest in Colombia, Venezuela, the Guianas and Amazonian Peru and Brazil. Flowering May to October in Amazonia. 1.XI.1972 (st) *Rodrigues, W. 9133* (INPA).

3.2 *Hirtella duckei* Huber, Bol. Mus. Emílio Goeldi 6: 74. 1910.

Shrubs or small **treelets**. Twigs hispid, lenticellate. **Leaves** oblong to elliptic, thin-coriaceous, (15–)20–30 × 6–11 cm, acuminate at apex, with acumen 5–20 mm long, base bearing swollen ant cavities, subcordate, hirsute on venation beneath; midrib prominulous above; primary veins 11–18 pairs, prominent and hirsute beneath; petioles 5–8 mm long, obscured by domatia, hispid, terete, eglandular. Stipules filamentous, to 1 mm long, hispid, persistent. Inflorescences elongate racemes, 2–12 cm long, the rachis hispid. Bracts and bracteoles 2–3 mm long, linear, hirsute, subsistent, eglandular. **Flowers** 5–6 mm long. Receptacle campanulate, hispid on exterior, glabrous within except for deflexed hairs at throat; pedicels 4–6 mm long. Calyx lobes oblong, hispid on exterior, puberulous within. Petals 5, pale purple, exceeding calyx lobes. Stamens 5–8, unilateral, the filaments far exceeding calyx lobes. Style hirsute at base only. Ovary pilose, inserted at or near mouth of receptacle. **Fruit** not seen.

Type: BRAZIL. AMAZONAS: *Ducke s.n.* (fl) (holotype, MG6756; isotypes, BM, P, RB, US).

Terra firme forest in Guyana and central and western Amazonia.

10.IX.1987 (fl) *Pruski, J. F. et al. 3205* (K INPA);

24.XI.1993 (bd) *Ribeiro, J. E. L. S. et al. 1182* (K);

26.XII.1996 (bd) *Sothers, C. A. et al. 968* (INPA);

17.XI.1996 (fr) *Souza, M. A. D. et al. 276* (INPA).

3.3 *Hirtella fasciculata* Prance, Fl. Neotrop. 9: 348. 1972.

Medium to large sized **trees**. Twigs tomentellous not lenticellate. **Leaves** elliptic, coriaceous, 9–12.5 × 5–6.5 cm, apex abruptly acuminate, the acumen 1–4 mm long, rounded at base, slightly bullate above, hirsute beneath; midrib prominulous above, prominent beneath, hirsute; primary veins 8–10 pairs, impressed above, prominent beneath; petioles 2–3 mm long,

terete, eglandular, tomentose. Stipules 2.5 mm long, lanceolate, caducous, tomentose, eglandular. **Inflorescence** a fasciculate raceme, axillary, 1–2 cm long, rachis tomentellous. Bracts 2–3.5 mm long, linear, tomentellous, persistent, eglandular. Receptacle campanulate, hirsute-tomentellous on exterior, glabrous within; pedicels 1–2 mm long, eglandular. Calyx lobes acute, tomentellous on exterior, puberulous within. Petals 5, glabrous. Stamens 4, unilateral, filaments glabrous, far exerted. Ovary inserted on middle of receptacle, pilose. Style hirsute. **Fruit** unknown. **Type:** BRAZIL. AMAZONAS: Manaus, Reserva Florestal Ducke, *Rodrigues & Loureiro 5947* (fl) (holotype NY; isotype INPA).

Terra firme forest in Central Amazonian Brazil. Collected in flower in July and September.

This species has not been recollected in Reserva Ducke.

3.4 *Hirtella hispidula* Miq., Stirp. Surinam. Select. 28, t. 7b. 1850.

Trees to 15 m tall, usually smaller, not buttressed. **Bark** smooth unfissured; inner bark dark red. Twigs hirsute-hispid, becoming glabrous with age. **Leaves** elliptic to oblong, coriaceous, 5.5–15 × 2.2–5 cm, acuminate at apex, with acumen 5–15 mm long, subcordate to rounded at base, hirsute on principal venation beneath, the palisade glands occasional; primary veins 8–12 pairs, prominulous on both surfaces; midrib prominulous above, prominent and hirsute beneath; petioles 1.5–3 mm long, terete, eglandular, hispid. Stipules 3–9 mm long, linear, persistent, hispid, eglandular. **Inflorescences** terminal and axillary racemes 6.5–28 cm long, the rachis hispidulous on lower portion. Bracts and bracteoles 1.5–3.5 mm long, linear-lanceolate, persistent, tomentellous-hispid, terminating at apex in a long thin stipitate gland, usually with several stipitate glands on margins. **Flowers** 4–5 mm long. Receptacle campanulate, sparsely pilose on exterior, glabrous within except at throat; pedicels 2–8 mm long, eglandular. Calyx lobes acute, sparsely pilose to glabrescent on exterior, sparsely puberulous within. Petals 5, pinkish-purple, glabrous. Stamens 4–5, unilateral

with toothed staminodes opposite them, the filaments far exceeding calyx lobes, glabrous. Style hirsute up to one third its length. Ovary inserted at mouth of receptacle, pilose-tomentose. **Fruit** ellipsoid; epicarp smooth, glabrous; mesocarp thin, fleshy; endocarp thin, hard, smooth, opening longitudinally, hirsute within.

Type: SURINAME. *A. Focke s.n.* (fl) (holotype U).

Primary forest on terra firme in the Guianas and Amazonia to northern Bolivia. A common species most likely to occur in Reserva Ducke.

26.VIII.1957 (fl) *Rodrigues, W. 538* (IANINPAMGNY).

3.5 *Hirtella myrmecophila* Pilg., Verh. Bot. Ver. Brand. 47: 148. 1905.

Small trees to 7 m tall. Twigs sparsely hispid. **Leaves** coriaceous, oblong to oblong-lanceolate, 9–19 × 4–7(–8.5) cm broad, acuminate at apex, with acumen 6–17 mm long, base bearing swollen ant cavities, rounded to subcordate, slightly bullate beneath, with sparse hispid pubescence on principal venation; primary veins 12–14 pairs, prominent above; midrib prominent above; petioles 4–6 mm long, obscured by domatia, hispid, terete, eglandular. Stipules filamentous to 12 mm long, subpersistent, hispid. **Inflorescences** fasciculate racemes, 1–3.5 cm long, the rachis glabrescent with a few hispid hairs. Bracts and bracteoles linear, to 3.5 mm long, usually with paired sessile basal glands, hispid. **Flowers** ca. 4 mm long. Receptacle campanulate, sparsely hispid on exterior, glabrous within except for deflexed hairs at throat; pedicels 4–5 mm long. Calyx lobes acute, sparsely hispid on exterior, puberulous within. Petals 5, glabrous. Stamens 4–5, unilateral, the filaments far exceeding the calyx lobes. Style glabrous except for hirsute base. Ovary inserted midway up receptacle tube, pilose. **Fruit** oblong with blunt apex; epicarp glabrous; mesocarp very thin; endocarp very thin, glabrous within.

Type: BRAZIL. AMAZONAS: *Ule 6916* (fl) (holotype B, lost; lectotype HBG).

Terra firme forest in central Amazonian Brazil.

14.VIII.1995 (bd) *Costa, M. A. S. et al. 344* (K); 6.IX.1966 (fl) *Prance, G. T. et al. 2201* (INPA); 28.IV.1988 (fl) *Ramos, J. F. 1884* (INPA K); 27.IX.1966 (fl) *Rodrigues, W. & Monteiro, O. P. 8249* (INPA); 12.VIII.1995 (fl) *Souza, M.A. D. 85* (INPA K); 4.IV.1994 (fl) *Vicentini, A. et al. 458* (INPA K MG MONY SP); 6.IV.1994 (fl) *Vicentini, A. et al. 480* (INPA K); 31.V.1994 (fl) *Vicentini, A. et al. 558* (INPA).

3.6 *Hirtella physophora* Mart. & Zucc., Abh. Math.-Phys. Cl. Konigl. Bayer. Akad. Wiss. 1: 374–377. 1832.

Small trees to 6 m tall. Twigs sparsely hispid, lenticellate. **Leaves** membranous, oblong-elliptic to oblong, 17–30 × 6–11 cm, acuminate to mucronate at apex, with acumen 5–20 mm long, base bearing swollen ant cavities, subcordate, hirsute on venation beneath; midrib prominent above; primary veins 13–16 pairs, prominent beneath; petioles 5–8 mm long, obscured by domatia, hispid, terete, eglandular. Stipules filamentous, to 1.5 cm long, subpersistent, hispid. **Inflorescences** fasciculate racemes, 2–4 cm long, hispid. Bracts and bracteoles linear to filamentous, 2–8 mm long, hispid, persistent. **Flowers** 5–7 mm long. Receptacle campanulate, hispid on exterior, glabrous within except for deflexed hairs at throat; pedicels 3–4 mm long. Calyx lobes oblong-lanceolate, hispid on exterior, puberulous within near apex, glabrous beneath. Petals 5, glabrous, twice as long as calyx lobes, purple. Stamens 6, unilateral, the filaments far exceeding calyx lobes. Style hirsute on lower portion up to half of its length. Ovary inserted at mouth of receptacle, pilose. **Fruit** ellipsoid; epicarp smooth, glabrous; mesocarp thin, fleshy; endocarp thin, hard, bony.

Type: BRAZIL. AMAZONAS: *Martius s.n.* (fl) (holotype M).

Terra firme forest in Guianas and Amazonia. 23.II.1996 (fl) *Campos, M. T. V. A. et al. 517* (INPA K); 10.V.1996 (fl) *Hopkins, M. J. G. et al. 1593A* (INPA K); 10.IV.1975 (fl) *Prance, G. T. & Ramos, J.F. 23366* (INPA); 16.IV.1998 (bd) *Prance, G. T. et al. 30863* (K); 24.XI.1993 (fl) *Ribeiro, J. E. L. S. et al. 1178* (K); 7.VIII.1963 (fl) *Rodrigues, W. 5426* (INPA); 27.III.1995 (bd) *Sothers, C. A. et al. 371* (INPA K MG); 2.VI.1997 (fl) *Sothers, C. A. & Assunção, P. A. C. L. 999* (K); 4.IV.1994 (fl) *Vicentini, A. et al. 457* (INPA K).

3.7 *Hirtella piresii* Prance, Fl. Neotrop. 9: 283. 1972.

Small to medium-sized trees. Twigs glabrescent. Stipules linear, 1 mm long, eglandular, caducous. Leaves coriaceous, oblong, 3.5–9 × 1.4–3.2 cm, glabrous beneath, acuminate at apex, the acumen 2–10 mm long, cuneate at base; midrib prominulous above, prominent beneath, glabrescent; primary veins 8–11 pairs, slightly prominent on both surfaces; petioles 1–2 mm long, terete, eglandular, tomentellous when young. **Inflorescences** terminal and axillary panicles, 3–11 cm long, the rachis and branches glabrescent; bracts and bracteoles oblong to lanceolate, 2–5.5 mm long, puberulous or glabrescent, persistent; bracteoles with a single, reflexed, apical gland; pedicels 1.5–3 mm long. **Flowers** 4–5 mm long; receptacle campanulate, glabrous on exterior, glabrous within towards base; calyx lobes acute, glabrous on exterior, glabrescent within, the margins ciliate, eglandular; petals 5, glabrous; stamens 3, unilateral, with dentiform staminodes opposite to them, the filaments glabrous, far exerted; ovary pilose, style hirsute. **Fruit** pyriform when young; epicarp smooth, glabrous, mesocarp thin, fleshy, endocarp hard, thin, bony, hirsute within.

Type: BRAZIL. PARÁ: Black, Cordeiro & Mello 52-14653 (fl) (holotype NY).

Widespread in terra firme forest in Amazonian Brazil and reaching Southern Guyana and W. Surinam.

14.VII.1965 (fl) Rodrigues, W. & Monteiro, O. P. 6975 (INPA).

3.8 *Hirtella racemosa* Lam., Encycl. 3: 133. 1789.

Shrubs or small trees, or occasionally medium-sized tree. Twigs usually puberulous but varying from tomentellous to glabrous or sparsely hispid. Leaves elliptic to oblong, coriaceous, 3.5–16.5(–19.5) × 1.5–7 cm, acuminate at apex, with acumen 1–14(–25) mm long, subcordate to cuneate at base, the lower surface glabrous or sparsely appressed-pubescent; midrib prominulous above, prominent beneath; primary veins 6–10 pairs, prominulous above, prominent beneath; petioles 1–3 mm long, terete, eglandular, glabrous to puberulous. Stipules 1.5–5 mm long, linear, eglandular, persistent, glabrous to hirsutulous. **Inflorescences** terminal and axillary racemes 5–29 cm long, the rachis puberulous to glabrescent. **Flowers** 3.5–6 mm long. Bracts and bracteoles 0.5–3 mm long, sparsely appressed-pubescent, persistent, usually with sessile glands mostly towards base, or with a single large rotund concave gland, glandular or eglandular at apex, if glandular then bract with a distinct flattened lamina, the bracts very rarely eglandular. Receptacle campanulate, sparsely puberulous to glabrescent on exterior, glabrous within except at throat; pedicels 1.5–11 mm long. Calyx lobes acute, sparsely puberulous on exterior, puberulous within. Petals 5, glabrous, pink. Stamens 5–7, unilateral, the filaments far exceeding calyx lobes, glabrous or sparsely hirsute towards base. Style hirsute up to one third its length. Ovary inserted at mouth of receptacle, pilose-tomentose. **Fruit** ellipsoid; epicarp smooth, glabrous; mesocarp thin, fleshy; endocarp thin, hard, bony, hirsutulous within.

This species is divided into several varieties none of which have yet been collected in Reserva Ducke, but two of which are likely to occur.

Key to the varieties of *Hirtella racemosa*

1. Leaves 7–19.5 cm long, usually subcordate at base, less frequently rounded to cuneate; leaf venation inconspicuous above; pedicels usually thick, 1.5–7(–9) mm long; bracteoles mostly bearing large sessile concave glands, or reduced to a single large concave gland, less frequently the glands smaller and plane *Hirtella racemosa* var. *racemosa*
- 1'. Leaves 3.5–9.5(–11.5) cm long, usually rounded to cuneate (very rarely subcordate) at base; leaf venation usually prominently reticulate above; pedicels slender, 4–10.5 mm long; bracteoles with small sessile plane glands or an apical gland only *Hirtella racemosa* var. *hexandra*

3.8a *Hirtella racemosa* var. *racemosa*
Hirtella racemosa Lam., Encycl. 3: 133. 1789.

Leaves 7–19.5 cm long, usually subcordate at base, less frequently rounded to cuneate; venation inconspicuous above; pedicels usually thick, 1.5–7(–9) mm long, eglandular; bracteoles mostly bearing large sessile concave glands, or reduced to a single large concave gland, less frequently glands smaller, plane and not concave, or the bracteoles with apical glands.

Type: FRENCH GUIANA. *Badier s.n.* (fl) (holotype P-LAM).

Primary forest especially beside rivers and streams, but also in understorey of forest on terra firme from Panama and Colombia through the Guianas and Amazonia to northern Bolivia.

3.8b *Hirtella racemosa* var. *hexandra* (Willd. ex Roem. & Schult.) Prance, Fl. Neotrop. 9: 328. 1972.

Hirtella hexandra Willd. ex Roem. & Schult., L., Syst. veg. ed. 9, 5: 274. 1819.

Leaves 3.5–9 cm long, usually rounded to cuneate (very rarely subcordate) at base; venation usually prominently reticulate above; pedicels slender 4–10.5 mm long, eglandular; bracteoles with small sessile plane glands, or with a single apical gland only.

Type: VENEZUELA. *Humboldt & Bonpland s.n.* (fl) (holotype B Herb Willdenow 4850; isotype P; photo NY).

3.9 *Hirtella rodriguesii* Prance, Fl. Neotrop. 9: 310. 1972.

Trees to 20 m tall, not buttressed. **Bark** smooth, not fissured, crumbling; inner bark reddish-brown, without exudate. Twigs hispid. **Leaves** oblong to ovate-elliptic, membranous, 3.5–7.5 × 1.5–3.8 cm, glabrous beneath except for midrib, glandular; apex acuminate, the acumen 3–9 mm long; base rounded to subcuneate; midrib slightly prominent above, prominent and sparsely hirsute beneath; primary veins 6–9 pairs, plane above, prominulous beneath; petioles 1–3 mm long,

terete, eglandular, hirsute when young. Stipules linear, ca. 2 mm long, hispid, persistent. **Flowers** 4–5 mm long. **Inflorescence** terminal and axillary panicles or racemes, 2.5–7 cm long, the rachis and branches sparsely hispid. Bracts and bracteoles 1.5–2.5 mm long, lanceolate, puberulous, persistent, eglandular or with sparse sessile glands on margins. Receptacle campanulate, hispid on exterior, glabrous within at base; pedicels 1.5–3 mm long. Calyx lobes acute, sparsely hispid on exterior, sparsely puberulous within. Petals 5, white, glabrous. Stamens 4–5, unilateral; filaments glabrous, far exerted, connate at base. Ovary pilose. Style hirsute. **Fruit** unknown.

Type: BRAZIL. AMAZONAS: Manaus, Reserva Florestal Ducke, *W. Rodrigues & Osmarino 6735* (fl) (holotype, NY; isotype INPA).

Terra firme forest in central Amazonian Brazil. Flowering June to September. *Vicentini 1053* fl (INPA) and the type cited above.

4. *Licania*

Licania Aubl., Hist. Pl. Guiane 1: 119, t. 45. 1775.

Moquilea Aubl., Hist. Pl. Guiane 1: 521, t. 208. 1775.

Small to large **trees** or **shrubs**, rarely suffrutices. **Flowers** hermaphrodite. **Leaves** entire, glabrous above at maturity, lanate or pulverulent or strigose or glabrous or with stomatal cavities on lower surface. Petioles with two or more sessile glands, or eglandular. Bracts and bracteoles usually eglandular, usually small, very rarely large and enclosing small groups of flower buds. **Inflorescences** most frequently sparsely branched racemose panicles, less frequently a panicle of cymules or a spike. Receptacle 1–8 mm long, varying from subglobose or campanulate to urceolate, the interior always pubescent. Calyx lobes 5, acute. Petals (4–)5 or absent. Stamens 3–40, unilateral or inserted in a complete circle; filaments usually free to base, rarely connate, usually glabrous, long-exserted beyond the calyx lobes to short and included. Ovary inserted at or near the base of the receptacle, rarely slightly laterally inserted, usually pilose; carpel unilocular, ovules 2. Style filiform, of

varied length. **Fruit** a small to large, dry or fleshy drupe, exterior varying from densely tomentose to pulverulent or glabrous, the surface smooth or verrucose; pericarp sometimes in one layer, more often divided into a fleshy mesocarp and a hard woody or bony endocarp which has no special mechanism for seedling escape. Seed large, erect, filling the loculus. Germination hypogeal, first leaves alternate.

Type species: *Licania incana* Aubl. The name *Licania* is derived from the vernacular name "Calignia", intended to be an anagram.

Largely New World from Mexico, Florida, West Indies to Southern Brazil, with three species in the Asiatic tropics, one very widespread, and one in West Africa. Most abundant in the lowland forests and savannas of the Guianas and the Amazon Basin, and with 30 species collected in Reserva Ducke.

The genus *Licania* was divided into two subgenera and several sections in Prance (1972). Representatives of seven of the eight sections occur in Reserva Ducke.

- a. Subgenus *Moquilea* section *Moquilea* - Stamens 15–20, filaments free almost to the base, exerted; petals present.
- b. Subgenus *Moquilea* section *Leptobalanus* - Stamens 8–15, filaments free almost to base, exerted; petals absent.
- c. Subgenus *Licania* section *Hirsuta* - Stamens 7–10, filaments connate for half of length, included; petals present; leaves sparsely hirsute beneath.
- d. Subgenus *Licania* section *Hymenopus* - Stamens 5–8, filaments free to base or connate for half of length, included; petals present (in all Ducke species) or absent; leaves glabrous beneath.
- e. Subgenus *Licania* section *Cymosa* - Stamens 3–7, filaments free to base, included; petals absent; leaves pulverulent or lanate beneath; flowers borne in few flowered cymules inserted on primary inflorescence branches.
- f. Subgenus *Licania* section *Pulverulenta* - Stamens 3–5, filaments free to base, included; petals absent; leaves pulverulent beneath; flowers not borne in cymules.

g. Subgenus *Licania* section *Licania* - Stamens 3–8, filaments free to base, included; petals absent, leaves lanate or with stomatal cavities beneath; flowers not borne in cymules.

4.1 *Licania adolphoduckei* Prance, Novon 11: 325. 2001. **Fig. 1**

Tree to 15 m tall, the young branches glabrous. **Leaf** lamina oblong, coriaceous, 8–13.5 × 3.5–6.5 cm, cuneate at base, acuminate at apex, the acumen 3–10 mm long, glabrous on both surfaces, with scattered glands beneath; midrib prominulous above, prominent and glabrous beneath; primary veins 12–6 pairs, prominulous on both surfaces, 7–11 mm between veins; petiole 4–6 mm long, glabrous, rugose, eglandular, with lamina base slightly confluent. Stipules axillary, interpetiolar, ca. 2 mm long, persistent. **Inflorescences** of terminal and subterminal racemose panicles, the rachis sparsely puberulous. Bracts and bracteoles ca. 1 mm long, ovate, persistent, chartaceous, puberulous on exterior. **Flowers** 1–1.5 mm long, borne in few-flowered cymules attached to rachis and primary branches by short peduncles. Receptacle campanulate, sparsely grey puberulous on exterior, tomentose within; pedicels 0.5–1 mm long. Calyx lobes 5, triangular, puberulous on exterior. Petals 5, glabrous on exterior. Stamens 5, inserted around complete circle; filaments shorter than calyx lobes, glabrous, united at mid point, anthers deltoid. Ovary inserted at base of receptacle, puberulous; style puberulous on lower portion. **Fruit** ovoid, 6–8 cm long, 4–5 cm broad, constricted near to base, exocarp glabrous, lenticellate, mesocarp 1–2 mm thick, endocarp thin, 0.5 mm thick, bony, glabrous within.

6.V.1997 (fl) *Assunção, P. A. C. L. et al. 502* (INPA holotype, K isotype); 1.II.1995 (fr) *Nascimento, J. R. & Pereira, E. C. 731* (INPA K); 23.XI.1993 (fr) *Ribeiro, J. E. L. S. et al. 1162* (INPA K); 23.XI.1993 (fr) *Ribeiro, J. E. L. S. et al. 1164* (INPA K); 23.XI.1993 (fr) *Ribeiro, J. E. L. S. et al. 1169* (INPA K); 26.IV.1996 (fl) *Ribeiro, J. E. L. S. et al. 1823* (INPA K); 25.III.1997 (fl) *Ribeiro, J. E. L. S. & Pereira, E. C. 1869* (G INPA K MG MO NYR RB SPU); 12.XI.1993 (fr) *Vicentini, A. 350* (INPA K).

Growing beside rivers and streams in forest, on sandy soil.

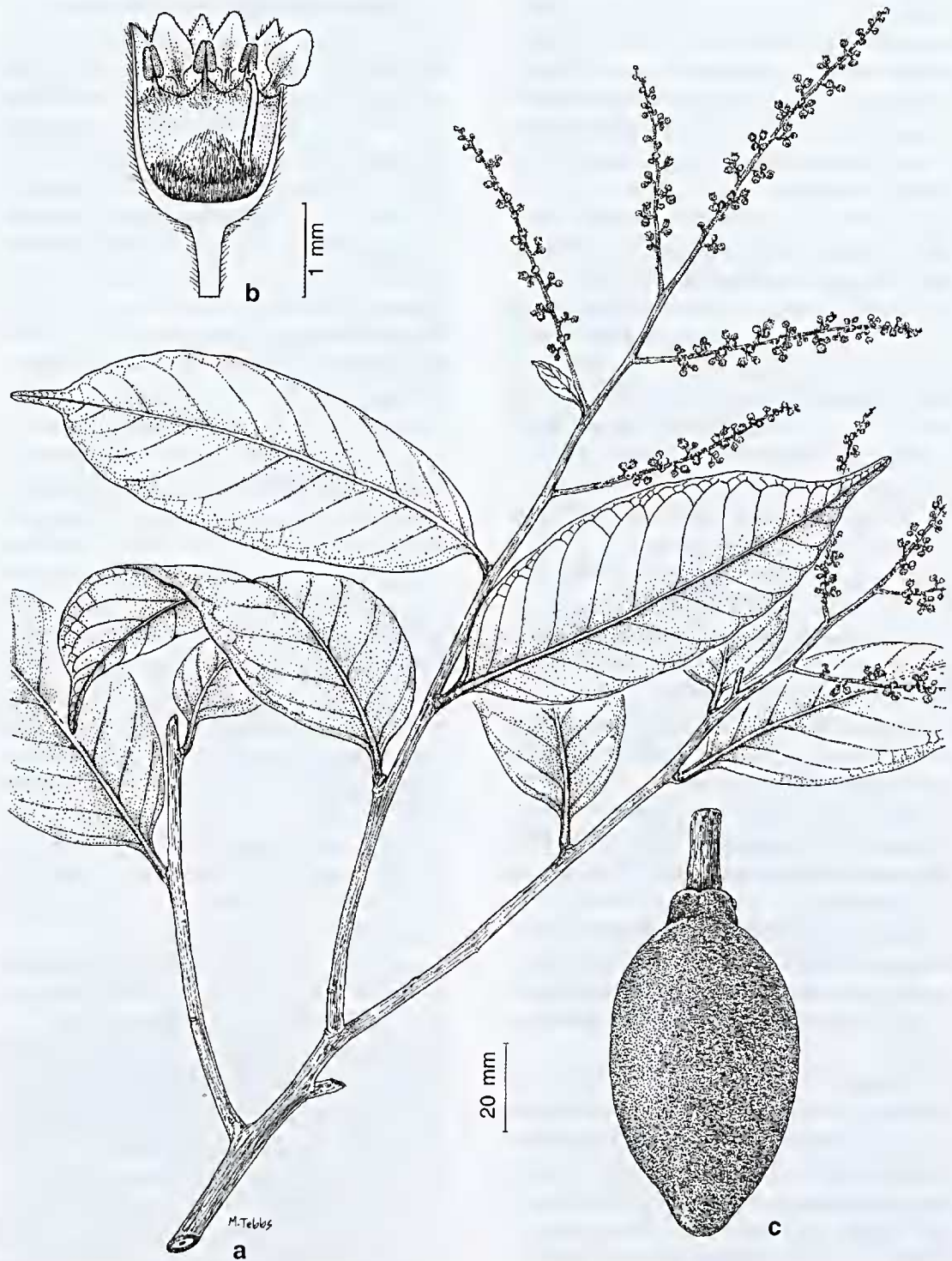


Figure 1 - *Licania adolphoduckei* - a. habit; b. half flower; c. fruit. (a Calderón 2944; b Assunção 502; c Ribeiro 1162)
Desenhado por M. Tebbs.

This species is close to *L. reticulata*, but differs in the smaller flowers which are borne in few-flowered cymules on the primary inflorescence branches, the smaller leaves, the base of which is decurrent onto the petiole; the larger fruit which is not longitudinally costate, and the smoother much less conspicuous secondary leaf venation. It is also close to *L. laevigata* and differs in the smaller flowers and inflorescence, the sparse grey puberulous rather than densely brown-tomentose exterior of the flowers, the primary veins which are 7–11 mm apart rather than 12–18 mm and in the larger ovoid fruit. The large fruit easily distinguishes this species from all other members of the *Licania heteromorpha* complex of subgenus *Licania* section *Hymenopus* to which it belongs.

Some of the material now placed in *L. adolphoduckei* was previously placed in *L. reticulata* by me, and the collections Ducke 488 and RB25031 were cited in the original description of *L. reticulata*. The detailed collections and observations of the Flora of the Reserva Florestal Adolfo Ducke project have enabled me to distinguish between these two species and so it was most appropriate to name it for Ducke. *L. reticulata* is a species of terra firme forest whereas *L. adolphoduckei* grows beside rivers.

4.2 *Licania apetala* (E. Mey.) Fritsch, Ann. K. K. Naturhist. Hofmus. 4: 54. 1889.

Hirtella apetala E. Mey., Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 21: 803. 1825.

Trees to 40 m tall. Twigs glabrous or sparsely puberulous, becoming glabrous, not lenticellate. Leaves oblong-ovate, elliptic, or oblong-lanceolate, coriaceous 3.7–14 × 1.3–6 cm, the apex usually with well developed acumen 3–18 mm long, rarely obtuse to rounded, rounded to subcuneate at base, glabrous on upper surface, glabrous or less often with persistent or caducous lanate pubescence on lower surface; midrib prominulous above, glabrous or sparsely pubescent when young; primary veins 7–12

pairs, prominent on lower surface, prominulous above; petioles 3–6 mm long, glabrous or sparsely pubescent when young, eglandular, terete. Stipules linear to 4 mm long, membranous, rarely persistent. Inflorescences racemose panicles, the rachis and branches gray-puberulous. Flowers 2–3 mm long, in small groups of cymules on short secondary branches (peduncles) of inflorescence or sessile on primary branches of inflorescence. Bracts and bracteoles 0.2–1 mm long, ovate to lanceolate, persistent. Receptacle campanulate, short-puberulous to tomentose on exterior, tomentose within, sessile or with short pedicels to 0.5 mm long. Calyx lobes acute, puberulous to tomentose on exterior, puberulous to glabrous within. Petals absent. Stamens ca. 10, inserted in a complete circle; filaments far exceeding calyx lobes, free almost to base. Ovary inserted at base of receptacle, villous. Style villous at base only, glabrous above, equalling filaments. Fruit globose to narrowly lanceolate-fusiform; epicarp smooth, glabrous; mesocarp very thin, fleshy; endocarp thin, fragile, fibrous, sparsely pubescent within.

Licania apetala var. *aperta* (Benth.) Prance, Fl. Neotrop. 9: 68. 1972.

Licania aperta Benth., J. Bot. Hooker 2: 218. 1840.

Flowers predominantly sessile on primary branches of inflorescence; fruit globose.

Type: GUYANA. *Schomburgk* 593 (fl) (holotype K; isotypes BMBR CGE GHL NY OXFP).

Riverine forest, river banks, beaches and savanna margins in the Guianas, Venezuela and Amazonia.

27.XI.1997 (fr) *Assunção, P.A. C. L. & Souza, M.A. D. 727* (IAN INPA K MONY RB SP U UB); 27.II.1998 (fl) *Assunção, P.A. C. L. et al. 801* (BM IAN INPA K MBM SPF UEC US VEN); 9.II.1995 (fl) *Hopkins, M. J. G. et al. 1531* (INPA K MG MO NY R RB SP U); 2.IX.1994 (bd) *Sothers, C.A. et al. 159* (INPA K MG MONY R RB SP U); 18.I.1996 (fl) *Sothers, C.A. et al. 759* (IAN INPA K MO NY RB SP U UB); 26.I.1995 (bd) *Vicentini, A. et al. 814* (INPA K MG MONY PR RB SP U); 31.I.1995 (fl) *Vicentini, A. et al. 820* (INPA).

4.3 *Licania bracteata* Prance, Fl. Neotrop. 9: 155. 1972.

Large trees, trunk without buttresses. **Bark** with shallow longitudinal fissures to 3 mm deep giving striate appearance, inner bark red near dead bark, brown within, translucent clear sap. Twigs puberulous, soon becoming glabrous and lenticellate. **Leaves** elliptic to oblong-elliptic, coriaceous, 5.5–16.5 × 2.5–8 cm, glabrous above, with stomatal cavities with lanate-pubescent apertures beneath, the venation between glabrous and conspicuous; apex acute or usually acuminate, the acumen 3–15 mm long, base rounded to subcordate; midrib impressed above, glabrous; primary veins 8–10 pairs, prominent beneath, plane and conspicuous above; petioles 7–10 mm long, tomentellous when young, terete, eglandular. Stipules lanceolate *ca.* 4 mm long, puberulent, subsistent adnate to base of petiole. **Inflorescence** of terminal and axillary racemose panicles; the rachis and branches puberulous. Bracts and bracteoles lanceolate, to 2.5 mm long, persistent, puberulous on exterior. **Flowers** *ca.* 2 mm long. Receptacle campanulate, sessile, gray-tomentulous on exterior, puberulous within. Calyx lobes acute, tomentellous on both surfaces. Petals absent. Stamens 5, unilateral, the filaments shorter than calyx lobes, pubescent. Ovary villous; style lanate. **Fruit** oblong-pyriform, to 7 cm long × 4–4.5 cm broad, exocarp velutinous pubescent; mesocarp thin; endocarp *ca.* 6 mm thick, woody and hard, glabrous within.

Type: BRAZIL. AMAZONAS: Manaus, *Ducke* 293 (2nd collection) (fl) (holotype K; isotypes IAN US).

This species was described from considerable material from the vicinity of Manaus, Brazil, where it is quite common in the forests on terra firme. Recently it has also been collected in Colombia and Peru.

24.VII.1997 (fl) *Assunção, P. A. C. L. et al.* 565 (INPA K MG MONY RRB SP U); 22.VIII.1997 (fl) *Assunção, P. A. C. L. et al.* 631 (BM G IAN INPA K MBM UB UEC US); 15.VIII.1997 (fl) *Hopkins, M. J. G. et al.* 1631 (COL F IAN INPA K PUEFR SPF UFMT VEN); 23.XI.1993 (fr) *Ribeiro, J. E. L. S. et al.* 1172 (K); 6.XII.1995 (fr) *Sothers, C. A. & Pereira, E. C.* 688 (G INPA K MBM MG R U UB US); 5.IV.1994 (fr) *Vicentini, A. et al.* 475 (INPA K MG MONY RRB SP).

4.4 *Licania canescens* Benoist, Bull. Mus. Natl. Hist. Nat. 25: 514. 1919.

Tree to 20 m without buttresses. **Bark** wrinkled by shallow longitudinal fissures, crumbling, inner bark thin, brown, no exudate, meally smell. Twigs glabrous, lenticellate. **Leaves** elliptic to oblong-elliptic, coriaceous, 4–12 × 2–5.5 cm, acuminate at apex, with acumen 4–15 mm long, rounded to cuneate at base, the margins plane, glabrous on upper surface, the lower surface with waxy gray pulverulent-furfuraceous pubescence; midrib glabrous above, plane; primary veins 6–9 pairs, prominent beneath, plane above; petioles 3–5 mm long, glabrous, terete or shallowly canaliculate, eglandular, transversely rugose. Stipules 2–4 mm long, linear, persistent, adnate to base of petiole. Inflorescences terminal and axillary racemose panicles, the rachis and branches glabrous or sparsely puberulous. Bracts and bracteoles 0.5–2 mm long, deltoid, persistent, exterior puberulous. **Flowers** *ca.* 2 mm long, in small groups on primary branches of inflorescence. Receptacle campanulate, sessile, tomentellous on exterior, tomentose within. Calyx lobes acute, tomentellous on both surfaces. Petals absent. Stamens 5, unilateral; filaments shorter than calyx lobes, glabrous, free to base. Ovary inserted at base of receptacle, tomentose. Style equalling filaments, sparsely pubescent throughout. **Fruit** pyriform, *ca.* 3.5 cm long; epicarp glabrous, drying yellow and wrinkled; mesocarp thin; endocarp hard, thick, fibrous, hirsutulous within. **Type:** FRENCH GUIANA. Maroni, *Melimon s.n.* (fl) (lectotype P; isolectotypes GH K).

Riverine, periodically flooded and terra firme forest in the Guianas, and eastern, central and southern Amazonia.

13.VIII.1997 (fl) *Assunção, P. A. C. L. et al.* 611 (BM COL INPA K MBM MG UB UEC US VEN); 15.VIII.1997 (fl) *Hopkins, M. J. G.* 1634 (G INPA K MG MONY RRB SP U); 14.IV.1998 (st) *Prance, G. T. et al.* 30853 (K); 23.XI.1993 (fr) *Ribeiro, J. E. L. S. et al.* 1170 (INPA K MG MONY RRB SP); 25.XI.1993 (galled) *Ribeiro, J. E. L. S. et al.* 1188 (INPA K MG NY); 26.XII.1996 (fr) *Sothers, C. A. et al.* 967 (INPA K MG MONY RRB SP U); 7.VIII.1994 (fl) *Vicentini, A. et al.* 662 (INPA K MG MONY RRB SP).

4.5 *Licania caudata* Prance, Fl. Neotrop. 9: 100. 1972.

Small trees. Twigs glabrous, lenticellate. Stipules caducous (not seen). Leaves subcoriaceous, ovate-elliptic, 8–11 × 3.5–5.5 cm, acuminate at apex, the acumens 7–9 mm long, cuneate at base, glabrous on both surfaces; midrib prominulous and glabrous above; primary veins 8–9 pairs, plane above, prominent beneath; petioles 5–7 mm long, glabrous, eglandular, weakly canaliculate. **Inflorescences** terminal and axillary racemose panicles, the rachis and branches glabrous or sparsely hirsutulous; bracts and bracteoles minute, lanceolate, caducous; pedicels *ca.* 0.5 mm long. **Flowers** 2 mm long; receptacle campanulate, sparsely hirsute on exterior, tomentose within; calyx lobes acute, sparsely hirsutulous on both surfaces; petals 5, sparsely pubescent; stamens 7–8, inserted in a complete circle, the filaments glabrous, connate for half of length, equalling calyx lobes; ovary tomentose, style equalling calyx lobes, pubescent to apex. **Fruit** oblong-ovoid, 2.2–3 × 1–1.3 cm; epicarp glabrous, wrinkled-knobly when dry; mesocarp very thin; or puberulous; endocarp 0.5 mm thick, bony, glabrous within.

Type: BRAZIL, AMAZONAS: *D. Coelho 3946* (fl) (holotype, NY; isotype, INPA).

Throughout Amazonian Brazil and in Atlantic coastal forest.

14.VIII.1997 (fr) *Assunção, P. A. C. L. & Pereira, E. C. 614* (G INPA K MBM MG MO NY RB SP U UB UE); 16.06.1994 (fr) *Ramos, J. F. 2846* (INPA K MG MO NY RB SP U); 27.IV.1994 (fr) *Ribeiro, J. E. L. S. et al. 1281* (INPA K MG MO NY SP); 7.IV.1965 (fl) *Rodrigues, W. & Monteiro, O. P. 6894* (INPA); 13.V.1997 (fl) *Sothers, C. A. et al. 978* (IAN INPA K MO NY RB SP U UB VEN); 13.V.1997 (fl) *Sothers, C. A. & Assunção, P. A. C. L. 980* (BM G INPA K MBM MG SPF UEC US).

4.6 *Licania coriacea* Benth., Jour. Bot. (Hooker) 2: 221. 1840.

Trees to 25 m tall, not buttressed. Bark smooth but with prominent lenticels; inner bark pinkish-brown soon oxidising dark brown, no exudate. Twigs puberulous, soon becoming

glabrous and lenticellate. Leaves elliptic to oblong-ovate, thick-coriaceous, 3–12 × 1.5–5 cm, acute or acuminate at apex, with acumens to 6 mm long, cuneate to subcuneate at base, the margins revolute, glabrous above, with waxy gray pulverulent-furfuraceous pubescence beneath; midrib glabrous above, plane or slightly impressed; primary veins 6–8 pairs, prominulous beneath, plane above; petioles 3–6 mm long, eglandular, terete, pulverulent, becoming glabrescent with age. Stipules 2–4 mm long, lanceolate, coriaceous, adnate to base of petiole, persistent. **Inflorescences** little branched terminal and axillary racemose panicles, the rachis and branches tomentellous to puberulous. **Flowers** 3 mm long solitary or in small groups along primary branches of inflorescence. Bracts and bracteoles 0.5–2.5 mm long, deltoid, persistent, tomentellous on exterior. Receptacle urceolate, sessile, tomentellous on exterior, and within. Calyx lobes acute, tomentellous on both surfaces. Petals absent. Stamens 4–5, unilateral; filaments shorter than calyx lobes, glabrous, free to base. Ovary inserted at base of receptacle, tomentose. Style equalling filaments, tomentose. **Fruit** pyriform, 2.5–3 cm long; epicarp glabrous, drying yellow and wrinkled; mesocarp thin; endocarp *ca.* 3 mm thick, hard, granular and fibrous, velutinous within.

Type: GUYANA. *Schomburgk 50* (fl) (holotype K; isotypes BM BR CGE G L OXF TCD P US).

Terra firme forest in the Guianas and Central Amazonia.

27.VI.1997 (fl) *Sothers, C. A. et al. 1029* (BM COL G INPA K MBM MG SPF U UB UEC U); 27.VI.1997 (fl) *Sothers, C. A. et al. 1030* (INPA K MG MO NY RB SP U); 9.VII.1968 (fl) *Souza, J. A. 40* (INPA).

4.7 *Licania egleri* Prance, Fl. Neotrop. 9: 56. 1972.

Small to medium sized trees, with slight buttresses or prop roots at base. Bark slightly rugose not fissured; inner bark pinkish or red with dark red inner part, with red exudate with fragrance of winter green. Twigs glabrous, lenticellate. Leaf lamina obovate to elliptic, coriaceous, 4.5–8.5 × 2–4 cm, glabrous on both surfaces with glands on lower surface and two

glands at junction with petiole; apex retuse or shortly apiculate; base rounded to subcuneate; midrib prominent and glabrous above; primary veins 8–13 pairs, prominulous on both surfaces, inconspicuous; petiole 2–5 mm long, glabrous, rugose, terete, eglandular. Stipules small, 1–2 mm long, ovate, membranous, intrapetiolar, subsistent. **Flowers** 2–2.5 mm long. **Inflorescence** of terminal and subterminal racemose panicles, the rachis and branches puberulous. Bracts and bracteoles 0.5–1.5 mm long, ovate, membranous, persistent, sparsely pubescent. Receptacle campanulate, gray-tomentellous on exterior, tomentose within; pedicels 0.5–1 mm long. Calyx lobes acute, tomentellous on exterior, puberulous within. Petals 5, pubescent. Stamens *ca.* 15, inserted around complete circle; filaments exerted, glabrous, free to base. Ovary villous-tomentose. Style villous. **Fruit** ovoid, 4–5 cm long; exocarp smooth, glabrous.

Type: BRAZIL. PARÁ: Tapajós, rio Cururú, *Egler* 887 (fl) (holotype, NY; isotypes, IAN, MG).

Open terra firme forest, beside rivers and in tall *cerrado* (*cerradão*) in Amazonian Brazil and the northern limits of the Planalto of Central Brazil. Flowering May to October. Not yet collected in Reserva Ducke, but likely to occur.

4.8 *Licania gracilipes* Taub., Bot. Jahrb. Syst. 15 (Beibl. 34): 8. 1892.

Licania duckei Maguire, Trop. Woods 93: 29. 1948.

Trees to 20 m or shrubs. Twigs glabrous, obscurely lenticellate. **Leaves** lanceolate to oblong-lanceolate, coriaceous, 3.5–8×1.3–3.5 cm, the apex with a finely pointed acumen 10–15 mm long, cuneate or subcuneate at base, glabrous on upper surface, the lower surface with short dense white persistent lanate pubescence; venation shallowly reticulate; midrib glabrous, more or less plane above; primary veins 8–15 pairs, prominulous beneath, plane above; petioles 3–6 mm long, glabrous, eglandular, shallowly canaliculate. Stipules *ca.* 1.5 mm long, linear, coriaceous, persistent, adnate to extreme base of petiole. **Inflorescences**

terminal and axillary branched panicles, the rachis and branches glabrous. **Flowers** *ca.* 1.5 mm long, in cymules on long slender peduncles attached to primary inflorescence branches. Bracts and bracteoles minute, persistent, glabrous. Receptacle campanulate, glabrous on exterior, tomentellous within; pedicels 0.5–3 mm long. Calyx lobes acute, puberulous on both surfaces. Petals absent. Stamens 3, unilateral; filaments shorter than calyx lobes, glabrous, free to base. Ovary inserted at base of receptacle, tomentose. Style rising to base of filaments, pubescent. **Fruit** to 1.8 mm long, pyriform; epicarp pulverulent, drying reddish; mesocarp thin; endocarp hard, thin, sparsely hirsutulous within.

Type: BRAZIL. without locality, *Glaziou* 13800 (fl) (holotype, B, lost; isotypes, K P).

Terra firme forest in Amazonian Brazil.

11.VII.1997 (fl) *Assunção, P. A. C. L. et al.* 536 (INPA K MG MO NY R RB SP U); 25.IV.1957 (fl) *Chagas, J. s/n* INPA5549 (INPA); 19.VII.1997 (fl) *Forzza, R. C.* 304 (COL F IAN INPA K PUEFR SPF UFMT VEN); 10.IX.1997 (fr) *Pruski, J. F. et al.* 3221 ((K) INPA MG RB SP); 9.VIII.1995 (bd) *Sothers, C. A. et al.* 549 (BM G IAN INPA K MBM UB UEC US).

4.9 *Licania heteromorpha* Benth., Jour. Bot. (Hooker) 2: 221. 1840.

Tree to 30 m tall, often slightly buttressed. **Bark** reddish-brown, smooth and slightly flaking, slash dark red with very deep red sap; wood yellowish. Twigs hispid, or puberulous, glabrescent. **Leaves** elliptic-orbicular to oblong-coriaceous, 3–9 × 1.5–5.5 cm broad, retuse, rounded or slightly acute at apex, rounded to cuneate at base, glabrous on both surfaces; midrib prominulous above, glabrous; primary veins 6–11 pairs, plane or nearly so above, prominent beneath; petioles 2–5 mm long, glabrous when mature, shallowly canaliculate or terete, with two glands near to lamina base. Stipules 1.5–4 mm long, membranous, subsistent or caducous, linear. **Inflorescences** terminal and subterminal racemose panicles, the rachis and branches puberulous to tomentellous. **Flowers** 1.5–3 mm long, in small groups along primary and secondary branches of inflorescence, sessile or subsessile. Bracts and bracteoles 0.3–2 mm long, linear to ovate, persistent.

Receptacle campanulate, tomentellous to tomentose on exterior, tomentose within. Calyx lobes acute, puberulous on both surfaces. Petals 5, pubescent. Stamens 5-7, inserted in a complete circle; filaments shorter than calyx lobes, free to base. Ovary inserted at base of receptacle, lanate to short-pubescent. Style rising to base of anthers, pubescent. **Fruit** globose; epicarp, velutinous-pubescent; mesocarp thin, fleshy; endocarp very thin, granular, hard, glabrous within.

This species was divided into four varieties in Prance (1972). Only var. *heteromorpha* occurs in Reserva Ducke. Some of the material placed here in *L. prismatocarpa* was also placed in var. *heteromorpha* in Prance (1972), see under that species.

Licania heteromorpha* var. *heteromorpha

Type: GUYANA. Schomburgk 873 (fl) (holotype K; isotypes BMFGHLNYOXFPUS).

An abundant forest species of Trinidad, Venezuela, the Guianas and Amazonian Brazil.

8.IX.1994 (fl) *Assunção, P. A. C. L. 44* (BGHIAN INPA K P PUEFR UEC); 20.IX.1996 (fl) *Assunção, P. A. C. L. et al. 408* (INPA K MG MONY R RB SP U); 25.VII.1997 (fl) *Assunção, P. A. C. L. et al. 567* (INPA K MG MONY R RB SP U); 12.V.1988 (fl) *Coêlho, D. 44-D* (GH IAN INPA K PUEFR S VIC); 12.VII.1994 (fl) *Hopkins, M. J. G. et al. 1467* (BM IAN INPA K MBM VEN); 6.VIII.1994 (fr) *Hopkins, M. J. G. et al. 1479* (GH INPA K MG P VIC); 5.VII.1994 (fl) *Nascimento, J. R. et al. 520* (GH INPA INPA K MG PUEFR S VIC W); 14.VII.1994 (fl) *Nascimento, J. R. & Pereira, E. C. 536* (GH INPA K MG PUEFR S); 3.XI.1994 (fr) *Nascimento, J. R. & Pereira, E. C. 621* (GH ICN INPA K MG P S VIC); 13.XII.1994 (fr) *Nascimento, J. R. et al. 688* (GH ICN INPA INPA K MG NY P VIC); 1.VII.1993 (fl) *Ribeiro, J. E. L. S. et al. 961* (INPA K); 12.VIII.1993 (fl) *Ribeiro, J. E. L. S. et al. 1125* (G INPA K MG UB US); 15.VII.1995 (st) *Sothers, C. A. et al. 509* (K); 5.XII.1995 (fr) *Sothers, C. A. & Pereira, E. C. 690* (B F INPA K MG P PUEFR UFMT VIC); 15.VII.1994 (fl) *Vicentini, A. & Assunção, P. A. C. L. 609A* (COL F INPA K MG SPFUFMT).

Table 2 - Characters to separate species of the *Licania heteromorpha* complex

	<i>L. heteromorpha</i>	<i>L. prismatocarpa</i>	<i>L. reticulata</i>	<i>L. laevigata</i>	<i>L. sothersiae</i>
Leaf size	3-9 × 1.5-5.5	5-11 × 3-7	12-24 × 4.5-10	6-18 × 3-7	5.5-11 × 3-5.5
Leaf apex	round retuse	round apiculate	acuminate	acuminate	retuse round
Petiole gland	+ apex	-	+ apex	-	+ median
Petiole hairs	glabrous	pubescent	glabrous	glabrous	pubescent
Petiole size	2-4	3-6	7-12	5-8	7-9
Fruit shape	globose	oblong	oblong	globose	?
Fruit hairs	pubescent	glabrous	glabrous	pubescent	?
Fruit costate	-	+	+	-	?
Stipule size caducous	2-5 mm, persistent	1-2 mm, persistent	2 mm, caducous	caducous	4-5 mm,
Leaf reticulate	-	+	+	-	+
Flowers in cymules	+/-	+	+	-	-

4.10 *Licania hirsuta* Prance, Fl. Neotrop. 9: 92. 1972.

Shrubs to medium sized **trees**. Twigs hirsutulous soon becoming glabrous, not lenticellate. **Leaves** oblong-elliptic, coriaceous, 12–19 × 5–8.5 cm, cuneate at base; apex acuminate, the acumen 3–6 mm long, glabrous above, venation hirsute beneath; midrib impressed towards base, plane towards apex, pubescent; primary veins 9–10 pairs, impressed above, prominent beneath, venation also slightly impressed above; petioles 7–8 mm long, terete, hirsutulous, eglandular. Stipules linear, 4–5 mm long, coriaceous, axillary, persistent. **Inflorescence** of terminal or axillary racemose panicles, the rachis and branches sparsely hirsute. Bracts ovate, to 5 mm long, bracteoles minute, persistent, hirsute on exterior. Receptacle campanulate, sessile, hirsute on exterior, tomentose within. Calyx lobes acute, puberulous on both surfaces. Petals 5, pubescent, not unguiculate. Stamens 7–9, inserted around complete circle; filaments glabrous, connate for half length, included. Ovary villous. Style villous for half length. **Fruit** oblong-ovoid, ca. 2 × 1.2 cm; exocarp glabrous, usually knobby wrinkled when dry; mesocarp thin; endocarp 0.5 mm thick, boney, glabrous within.

Type: BRAZIL. AMAZONAS: Rio Tefé, Fróes 26137 (fl) (holotype, NY; isotypes, IAN, NY).

Flooded and terra firme forest in Brazilian Amazonia.

14.V.1995 (fl) *Cordeiro, I. et al. 1549* (INPA K MG MONYRRB SPU); 10.VI.1964 (fl) *Rodrigues, W. & Loureiro, A. 5844* (INPA); 4.VIII.1995 (fr) *Sothers, C. A. & Silva, C. F. 536* (INPA K MG MONYRRB SPU).

4.11 *Licania hypoleuca* Benth., Bot. Voy. Sulphur. 91, t. 32. 1844.

Trees to 35 m tall. Twigs glabrous, lenticellate. **Leaves** ovate to oblong-lanceolate, membranous to coriaceous, 2.5–10(–11.5) × 0.8–4.5(–5.5) cm, the apex tapering to a fine acumen, 5–16 mm long, usually subcuneate at base but varying from rounded to cuneate, glabrous on upper surface, the lower surface short gray-pulverulent-farinnaceous or sordid-lanate; venation shallowly reticulate; midrib

plane to prominulous above, glabrous; primary veins 5–9 pairs, prominulous beneath, plane above; petioles 2–6 mm long, glabrous or pubescent and then becoming glabrous with age, transversely rugose, eglandular, terete or canaliculate. Stipules 1–2 mm long, linear, coriaceous, persistent, adnate to extreme base of petiole. Inflorescences terminal and axillary branched panicles, the rachis and branches sparsely puberulous. **Flowers** 1.5 mm long, on long slender peduncles attached to primary inflorescence branches. Bracts and bracteoles 0.2–0.5 mm long, persistent. Receptacle campanulate, gray-puberulous to tomentellous on exterior, tomentellous within; pedicels 0.25–1 mm long. Calyx lobes acute, puberulous on both surfaces. Petals absent. Stamens 3–5, unilateral; filaments shorter than calyx lobes, glabrous, free to base. Ovary inserted at base of receptacle, lanate. Style sparsely hirsute throughout. **Fruit** pyriform to ovoid, usually less than 1.5 cm long rarely 2 cm long; epicarp with sordid pulverulent indumentum; mesocarp thin; endocarp thin, hard, fibrous, hirsutulous within. **Type:** PANAMA. *Hinds s.n.* (fl fr) (holotype K; isotype LE).

A wide-ranging variety on sandy soils in forest and on savannas from southern Mexico through Central America, Colombia, Venezuela, the Guianas and scattered localities in Amazonian Brazil.

13.VI.1958 (fl) *Coêlho, L. 9* (INPA).

4.12 *Licania impressa* Prance, Fl. Neotrop. 9: 118. 1992.

Large to medium sized **trees**. Twigs puberulous, not lenticellate. **Leaves** oblong-lanceolate, coriaceous, 5.5–13 × 1.8–4 cm, rounded to subcuneate at base, apex acuminate, the acumen 3–7 mm long, glabrous above, densely arachnoid-lanate pubescent beneath with stomatal cavities beneath pubescence or deeply reticulate; midrib glabrous and impressed above; primary veins 9–12 pairs, plane or slightly impressed above, prominent beneath; petioles 7–14 mm long, tomentose when young, canaliculate, usually with 2 glands. Stipules lanceolate, coriaceous, subpersistent, adnate to

base of petiole. **Inflorescence** of terminal and axillary much branched panicles bearing flowers in small 2–3 flowered cymules; rachis and branches grey-brown tomentose. Bracts and bracteoles small, ovate, persistent, tomentose on exterior. Receptacle campanulate, tomentose on exterior, tomentose within; pedicels *ca.* 0.25 mm long. Calyx lobes acute, tomentose on both surfaces. Petals absent. Stamens 6–7, inserted around complete circle, filaments glabrous, free to base, included. Ovary pilose. Style shorter than calyx lobes, pubescent to apex. **Fruit** pyriform; exocarp sordid-tomentellous.

Type: BRAZIL. AMAZONAS: Manaus, Ducke (fl) (holotype K; isotype RB25032).

Terra firme forest in eastern and central part of Brazilian Amazonia.

3.IV.1997 (fr) *Assunção, P. A. C. L. et al.* 487 (INPA K MG NY SP); 15.VII.1997 (fl) *Assunção, P. A. C. L. et al.* 544 (INPA K MG MO NY RB SP U); 29.VII.1997 (fl) *Assunção, P. A. C. L. et al.* 575 (INPA K MG MONY RRB SP U); 7.VIII.1997 (fl) *Assunção, P. A. C. L. et al.* 590 (G INPA K); 31.X.1997 (fr) *Assunção, P. A. C. L. & Silva, C. F.* 709 (G IAN INPA K MBM MORB U UB); 26.IV.1988 (fl) *Ramos, J. F.* 1864 (INPA K MG MO NY RB SP U); 15.VIII.1996 (fl) *Sothers, C. A. & Assunção, P. A. C. L.* 894 (BM G INPA K MBM MG UB UECUS VEN); 25.VII.1968 (fl) *Souza, J. A.* 66 (INPA).

4.13 *Licania laevigata* Prance, Fl. Neotrop. 95: 41. 1989.

Tree to 20 m tall, trunk with low buttresses to 80 cm tall. **Bark** with shallow fissures giving a wrinkled appearance, crumbling; inner bark reddish-brown, without exudate. Twigs glabrous. Leaf lamina oblong, coriaceous, 6–18 × 3.2–7 cm, cuneate at base, acuminate at apex, the acumen 4–10 mm long, glabrous on both surfaces, shiny above; midrib prominulous above, prominent beneath; primary veins 7–10 pairs, prominulous on both surfaces, widely spaced with 1.2–1.8 cm between veins; petioles 5–8 mm long, with confluent leaf base, glabrous, eglandular. Stipules axillary, caducous. **Inflorescences** of terminal and subterminal racemose panicles, the rachis puberulous. Bracts and bracteoles minute, triangular, tomentose, subsistent. **Flowers** *ca.* 2 mm long, inserted

on primary inflorescence branches. Receptacle urceolate, brown-tomentellous on exterior, tomentose within; pedicels 0.5–1 mm long. Calyx lobes five, triangular, tomentellous on both surfaces. Petals five, pubescent on exterior, with ciliate margins. Stamens 6–7, inserted around three-fourths of circle with tooth-like staminodes opposite; filaments shorter than calyx lobes, free, glabrous; anthers deltoid. Ovary inserted at base of receptacle, tomentellous on exterior; style pubescent on lower portion. **Fruit** globose, exocarp densely short-ferruginous-tomentellous; mesocarp thin, 0.5 mm; endocarp very thin, *ca.* 0.1 mm, bony, glabrous within.

Type: BRAZIL. AMAZONAS: Manaus-Caracari Road km 45, Reserva Biológica do INPA, *M. F. Silva & L. Coêlho* 80 (fl) (holotype INPA; isotype NY).

Terra firme forests of central Amazonia and Surinam.

6.IV.1967 (fl) *Albuquerque, B. W. P. & Elias, J.* 20 (INPA); 4.IV.1997 (fl) *Assunção, P. A. C. L. et al.* 491 (BM G INPA K MBM MG UB UEC US); 18.VIII.1994 (fr) *Nascimento, J. R. & Pereira, E. C.* 575 (INPA K MG MOMTNY PR RB SP U); 14.IX.1971 (fr) *Prance, G. T. et al.* 14735 (INPA); 1.VII.1993 (fr) *Ribeiro, J. E. L. S. et al.* 960 (INPA K MG MONY RB SP); 25.XI.1993 (fr) *Ribeiro, J. E. L. S. et al.* 1187 (G INPA K MGR U UB); 7.IV.1988 (fl) *Santos, J. L.* 879 (INPA K MG MONY RB SP U); 23.VIII.1994 (fr) *Sothers, C. A. & Pereira, E. C.* 125 (INPA K MG MONY RRB SP U); 22.XI.1993 (fr) *Vicentini, A. & Assunção, P. A. C. L.* 376 (K); 5.IV.1994 (fl) *Vicentini, A. et al.* 464 (INPA K MG MONY RB SP).

4.14 *Licania lata* Macbride, Candollea 5: 369. 1934; Fl. Peru 1071. 1938.

Trees to 20 m tall. Twigs villous, becoming glabrous with age, not lenticellate. **Leaves** oblong-elliptic to elliptic, coriaceous, 9–21 × 3–8.5 cm, acuminate at apex, with acumen 7–20 mm long, rounded to subcuneate at base, glabrous above, with persistent lanate-pulverulent pubescence beneath, becoming sparse with age; with 2 large sessile glands at junction of lamina and petiole on lower surface; midrib prominent above, glabrous; primary veins 10–12 pairs, prominent on both surfaces; petioles 6–10 mm long, puberulous, becoming glabrous, terete or shallowly canaliculate, eglandular. Stipules caducous.

Inflorescences terminal and axillary racemose panicles, the rachis and branches brown-puberulous, sometimes arachnoid when young. **Flowers** 4–5 mm long, sessile on primary branches of inflorescence or on short peduncles in small groups. Bracts and bracteoles 1–4 mm long, ovate, persistent, puberulous on exterior, the margins entire or serrulate. Receptacle campanulate-cupuliform, sessile, tomentose on exterior, densely villous within. Calyx lobes acute, tomentellous on exterior, puberulous within. Petals absent. Stamens *ca.* 14, inserted in a complete circle; filaments far exceeding calyx lobes, free to base, glabrous. Ovary inserted at base of receptacle, densely pilose. Style villous almost to apex, equalling filaments. **Fruit** globose, 2–3 cm in diameter; epicarp smooth, glabrous, drying black; mesocarp very thin, fleshy; endocarp very thin, 0.5 mm thick, hard, sparsely hirsute within.

Type: PERU. Loreto, *Klug 560* (fl) (holotype F; isotype NY).

Terra firme forest and secondary scrub on sandy soil in western and central Amazonia. Flowering October to February.

22.II.1995 (fr) *Hopkins, M. J. G. et al. 1564* (INPA K MG NY SP); 24.XI.1994 (fl) *Ribeiro, J. E. L. S. & Silva, C. F. 1506* (INPA K MG MO NY R RB SPU).

4.15 *Licania latifolia* Benth. *ex* Hook. f., in Mart. Fl. bras. 14(2): 11. 1867.

Trees to 25 m tall, the trunk with prop roots at base; bark with shallow longitudinal fissures. Twigs pubescent, soon becoming glabrous and lenticellate. **Leaves** obovate to oblong-elliptic, thick coriaceous, 6–20 × 4.5–10.5 cm, rounded to bluntly apiculate at apex, rounded to subcuneate at base, glabrous on upper surface, prominently reticulate beneath, with sparse hirsute pubescence on venation; palisade glands absent; midrib plane above, tomentose when young; primary veins 12–20 pairs, slightly impressed above, prominent beneath, arcuate near lamina margins; petioles 7–15 mm long, rufous-brown tomentose, terete, usually with two or more medial sessile glands. Stipules intrapetiolar, 3–8 cm long, triangular, acuminate, membranous, persistent. **Inflorescences** spreading racemose panicles, the rachis and

branches ferruginous-tomentose. **Flowers** *ca.* 2.5 mm long, sessile, in dense glomerules on branches of inflorescence. Bracts and bracteoles to 1.5 mm long, ovate, persistent, tomentose on exterior. Receptacle urceolate, sessile, ferruginous-tomentose on exterior, tomentose within. Calyx lobes acute, tomentose on both surfaces. Petals 5, *ca.* 1 mm long, pubescent. Stamens 6–10, inserted in a complete circle; filaments connate for half of length, shorter than calyx lobes. Ovary inserted at base of receptacle, velutinous-tomentose. Style pilose throughout, equalling filaments. **Fruits** globose; epicarp rufous-velutinous; pericarp thin, hard, fibrous; sparsely pubescent within when young. **Type:** BRAZIL. PARÁ: *Spruce 457* (fr) (holotype K; isotypes CGE NY OXFP).

Terra firme forest in Guyana and Amazonian Brazil. Flowering July to December. 25.IX.1996 (fl) *Assunção, P. A. C. L. et al. 406* (BM G IAN INPA K MBM UB UEC US); 14.VIII.1993 (fl) *Ribeiro, J. E. L. S. et al. 1155* (INPA K MG MO NY RB SP); 25.XI.1993 (fr) *Ribeiro, J. E. L. S. et al. 1186* (INPA K MG MO NY RB SP U); 20.VII.1994 (fl) *Ribeiro, J. E. L. S. et al. 1345* (INPA K MG MO NY R RB SP U); 21.VIII.1996 (fl) *Sothers, C. A. & Silva, C. F. 897* (INPA K MG MO NY R RB SP U).

4.16 *Licania laxiflora* Fritsch, Ann. K. K. Naturhist. Hofmus. 4: 46. 1889.

Trees to 30 m tall, the trunk slightly swollen at base up to 1 m but not buttressed. **Bark** smooth, crumbling, lenticellate; inner bark brown, oxidising darker, no exudate. Twigs puberulous or rufous-hirsutulous, becoming glabrous with age. **Leaves** ovate to elliptic, coriaceous, 5–22 × 2.5–9 cm broad, acuminate, with acumen 2–10 mm long, rounded at base, glabrous above, the lower surface with deeply reticulate often hirsutulous venation, with the area between veins lanate; midrib slightly impressed above, tomentellous towards base; primary veins 7–10 pairs, prominent beneath, impressed and glabrous; secondary veins more or less parallel; petioles 4–8 mm long, densely rufous-tomentose, terete, eglandular or with medial glands. Stipules elliptic to lanceolate, 2–5 mm long, pubescent, intrapetiolar, subsistent. **Inflorescences** terminal and subterminal racemose panicles, the

rachis and branches rufous-tomentose. **Flowers** 2.5–3 mm long, sessile on primary branches of inflorescence. Bracts and bracteoles ovate, to 3 mm long, persistent, tomentose on exterior. Receptacle campanulate, sessile, tomentose on exterior, tomentose within. Calyx lobes acute, tomentose on both surfaces. Petals absent. Stamens 6–8, inserted in a complete circle; filaments shorter than calyx lobes, glabrous, free to base. Ovary inserted at base of receptacle, villous. Style equalling filaments, villous throughout. **Fruit** round to pyriform, to 10 cm long including the short stipe to 10 mm long; epicarp rufous-velutinous; mesocarp thin, fleshy; endocarp thick, hard, sparsely hirsutulous within. **Type:** GUYANA. *Schomburgk* 976 (fl) (holotype, W; isotypes, K, P).

Terra firme forest and clump Wallaba forest in the Guianas and Amazonian Brazil. 7.VII.1993 (fl) *Ribeiro, J. E. L. S. et al.* 1050 (INPA K MG MONY RRB SP U).

4.17 *Licania longistyla* (Hook. f.) Fritsch, Ann. K. K. Naturhist. Hofmus. 4: 56. 1889.

Moquilea longistyla Hook. f., in Mart. Fl. bras. 14(2): 24, t. 8. 1867.

Small to medium-sized trees to 20 m tall. Twigs puberulous, soon becoming glabrous. **Leaves** elliptic, coriaceous, 6–23 × 3.5–10 cm, acuminate at apex, with acumen 3–12 mm long, rounded to subcuneate at base, glabrous on upper surface, rarely papillose, the lower surface bearing well developed stomatal cavities with flattened venation leaving small slit-like lanate-pubescent apertures; midrib prominent above, pubescent towards base, becoming glabrous with age; primary veins 9–12 pairs, prominent below; petioles 5–13 mm long, terete, eglandular, densely pubescent, becoming glabrescent with age. Stipules linear, 3–8 mm long, membranous, intrapetiolar, subsistent. **Inflorescences** terminal and axillary racemose panicles, the rachis and branches gray-tomentellous. **Flowers** ca. 3 mm long, solitary on primary branches of inflorescence. Bracts and bracteoles 2–5 mm long, ovate to lanceolate, serrulate, usually with stipitate glands. Receptacle campanulate, gray-tomentose on

exterior, densely villous-tomentose within; pedicels 0.5–1.5 mm long. Calyx lobes acute, tomentose on exterior, puberulous within. Petals absent. Stamens ca. 10, inserted in a complete circle; filaments far exceeding calyx lobes, free to base, glabrous. Ovary inserted at base of receptacle, villous. Style villous on lower portion, equalling or exceeding filaments. **Fruit** globose, 2.5–3.5 mm in diameter; epicarp with appressed sordid yellow-velutinous pubescence; pericarp undifferentiated, thin, fragile, fibrous, sparsely villous within.

Type: VENEZUELA. TERR. AMAZONAS: *Spruce* 3232 (fl) (holotype K; isotypes BM BR GH LE NY OXFP).

Periodically flooded forest and terra firme of the Guianas and Amazonia.

24.V.1967 (fl) *Albuquerque, B. W. P. & Elias, J.* 59 (INPA); 1.V.1994 (fl) *Hopkins, M. J. G. & Assunção, P. A. C. L.* 1416 (INPA K MG MONY RRB SP U); 15.VI.1965 (fl) *Loureiro, A. & Coêlho, D. s.n.* (INPA 15512); 8.XI.1994 (fr) *Nascimento, J. R.* 626 (INPA K MG MONY RRB SP U); 29.XI.1963 (fr) *Rodrigues, W.* 5557 (INPA); 8.VII.1964 (fl) *Rodrigues, W. & Loureiro, A.* 5941 (INPA); 28.V.1965 (fl) *Rodrigues, W. & Monteiro, O. P.* 6946 (INPA); 30.VIII.1994 (fr) *Sothers, C. A. & Nascimento, J. R.* 153 (INPA K MG MONY RRB SP U).

4.18 *Licania macrophylla* Benth., Hooker's J. Bot. Kew Gard. Misc. 2: 240. 1850.

Medium to large-sized trees to 30 m. Twigs glabrous. **Leaves** narrowly oblong with parallel margins, coriaceous, 13–40 × 4.5–10.5 cm, acuminate to obtuse at apex, with acumen 6–11 mm long, rounded to cordate at base, glabrous on both surfaces; palisade glands absent; midrib prominulous above, glabrous; primary veins 12–16 pairs, prominent beneath, prominulous above; petioles 6–14 mm long, glabrous, usually shallowly canaliculate, with two sessile glands at base of lamina. Stipules linear, 6–15 mm long, submembranous, intrapetiolar, persistent. **Inflorescences** axillary racemose panicles on woody stems, the rachis and branches sparsely puberulous. **Flowers** 2.5–3 mm long, solitary or in small groups on primary and secondary branches of inflorescence. Bracts and bracteoles ovate to lanceolate, 1–3 mm long, puberulous on both surfaces, persistent,

entire. Receptacle campanulate to shortly urceolate, puberulous on exterior, arachnoid within; pedicels 0.25–0.5 mm long. Calyx lobes acute, puberulous on both surfaces. Petals 5, pubescent, shortly unguiculate. Stamens 5 fertile, with 5–6 staminodes, inserted in a complete circle; filaments slightly exceeding calyx lobes, connate at base to form a short tube, with a dense lanate mass surrounding filaments and filling mouth of receptacle. Ovary inserted at base of receptacle, lanate-tomentose. Style pubescent throughout, equalling filaments. **Fruit** ovoid to pyriform, to 8 cm diameter; epicarp smooth, glabrous or crustaceous-verrucose, drying black, mesocarp *ca.* 8 mm thick, hard when dry; endocarp thin, granular, glabrous within.

Type: BRAZIL. PARÁ: *Spruce 139* (fl) (holotype K; isotypes CGE NY OXF P).

Periodically flooded forest in the Guianas and eastern Amazonian Brazil.

8.X.1997 (fl) *Mesquita, M. R. et al. 28* (INPA K MG MONYR RB SPU); 16.IV.1998 (st) *Prance, G. T. et al. 30860* (INPA K).

4.19 *Licania micrantha* Miqu., Stirp. Surinam. Select. 20. 1850.

Trees to 30 m tall, trunk slightly swollen at base. **Bark** dotted with conspicuous, prominent lenticels, crumbling; inner bark dark red, no exudate. Twigs puberulous, soon becoming glabrous and lenticellate. **Leaves** ovate-elliptic to oblong, thick-coriaceous, 4.5–15 × 2.3–7 cm, margins plane, usually acuminate or caudate at apex, rarely acute, with acumen 2–14 mm long, rounded at base, glabrous above, the lower surface with dense brown lanate pubescence which is easily rubbed off; midrib more or less plane above, glabrous; primary veins 5–7 pairs, prominent beneath, plane above; petioles 4–12 mm long, puberulous when young, soon becoming glabrous, terete, cglandular. Stipules lanceolate to 7 mm long, glabrous, persistent, adnate to extreme base of petiole or axillary. **Inflorescences** terminal and axillary much-branched racemose panicles, the rachis and branches tomentellous to puberulous. **Flowers** *ca.* 2 mm long, sessile on primary branches of inflorescence. Bracts and bracteoles

0.5–1 mm long, ovate, persistent, exterior puberulous. Receptacle campanulate, sessile, tomentellous on exterior, tomentose within. Calyx lobes acute, puberulous on both surfaces. Petals absent. Stamens 3, unilateral; filaments shorter than calyx lobes, glabrous. Ovary inserted at base of receptacle, pilose. Style equalling filaments, pubescent throughout. **Fruit** pyriform, to 5 cm long, including stipe 5–10 mm long; epicarp with waxy pulverulent indumentum, wrinkled when dry; pericarp thin, hard, fibrous, densely hirsutulous within.

Type: SURINAME. *Hostmann 1257* (fl) (holotype U; isotypes F GH K LE NY P).

Terra firme forest in the Guianas, Colombia, Venezuela, Amazonia and eastern Brazil.

11.XII.1997 (fl) *Assunção, P. A. C. L. et al. 755* (BM G INPA K MBM MG UB US); 15.VIII.1963 (fl) *Rodrigues, W. 5436* (INPA); 30.XI.1963 (fl) *Rodrigues, W. 5563* (INPA); 29.IX.1994 (bd) *Sothers, C. A. 187* (INPA K MG MONYPR RB SPU); 23.X.1995 (fl) *Sothers, C. A. & Silva, C. F. 636* (INPA K MG MONYR RB SPU); 16.XII.1997 (fl) *Sothers, C. A. & Pereira, E. C. 1071* (COLFINPA K MG PUEFR SPF UFMT VEN).

4.20 *Licania niloi* Prance, Fl. Neotrop. 9: 129. 1972.

Trees to 20 m, without buttresses. **Bark** reddish-brown, flaking into small plaques *ca.* 1 mm thick, not fissured under the flakes; outer bark 1 mm thick; inner bark dark brown; wood yellowish. Twigs glabrous, not lenticellate. **Leaves** oblong-elliptic, coriaceous, 4–9 × 2–4.2 cm, rounded to subcuneate at base, acute at apex, glabrous above, pulverulent-farinaceous beneath; midrib plane and glabrous above; primary veins 5–7 pairs, prominent beneath, plane above; petioles 3–5 mm long, glabrous, terete, rugose, with two sessile glands. Stipules 2 mm long, lanceolate, coriaceous, persistent, adnate to base of petiole. **Inflorescence** of terminal and axillary panicles, rachis and branches tomentellous. Bracts and bracteoles 0.5–3 mm long, ovate, persistent, puberulous on exterior. Receptacle cylindrical-urceolate with swollen base, sessile, tomentellous on exterior, puberulous within. Calyx lobes lanceolate, puberulous on both surfaces. Petals absent.

Stamens 3, unilateral; filaments glabrous, free to base, included. Ovary shortly pubescent. Style puberulous to apex, shorter than calyx lobes. **Fruits** not seen.

Type: BRAZIL. RONDÔNIA: Porto Velho, *N. T. Silva* 392 (fl) (holotype, NY; isotype, IAN).

Known from vicinity of Manaus and from Rondônia. Forest on terra firme.

11.VII.1996 (fl) *Assunção, P. A. C. L. & Hopkins, M. J. G.* 345 (BM G IAN INPA K MBM UB UEC US); 22.VI.1994 (fl) *Hopkins, M. J. G. et al.* 1424 (INPAKMG MONYRBSP); 14.VII.1997 (bd) *Martins, L. H. P. & Assunção, P. A. C. L.* 30 (INPAKMGMONYR RBSP U); 23.IV.1965 (fr) *Rodrigues, W. & Monteiro, O. P.* 6911 (INPA); 29.VII.1965 (fl) *Rodrigues, W. & Monteiro, O. P.* 6997 (INPA); 27.XII.1996 (fr) *Sothers, C. A. & Pereira, E. C.* 969 (INPAKMG MONYR RBSPU).

4.21 *Licania oblongifolia* Standl., Field Mus. Nat. Hist., Bot. Ser. 17: 257. 1937.

Trees to 30 m tall with small thick swollen buttresses at base. **Bark** sometimes lightly fissured, inner bark reddish-brown, oxidising brown, with sparse red exudate. Twigs glabrous, not lenticellate. **Leaves** oblong, with parallel sides, coriaceous, 6–17 × 2.5–6 cm, rounded at apex, acute to short-acuminate, with acumen to 5 mm long, rounded to subcordate at base, glabrous on both surfaces; palisade glands occasional; midrib prominulous above, glabrous; primary veins 9–15 pairs, prominent beneath, prominulous above; petioles 5–11 mm long, glabrous, shallowly canaliculate, usually with two sessile glands at base of lamina. Stipules linear, 3–5 mm long, submembraneous, persistent. **Inflorescences** axillary panicles, the rachis and branches puberulous. **Flowers** 1.5–2 mm long, solitary on primary and secondary branches of inflorescence. Bracts and bracteoles 0.2–1 mm long, persistent, puberulous on exterior, entire. Receptacle campanulate, puberulous on exterior, puberulous within; pedicels 0.5–1 mm long. Calyx lobes acute, puberulous on both surfaces. Petals 5, densely lanate, usually short-unguiculate. Stamens 5–6 fertile, inserted in a complete circle; filaments equalling calyx lobes, slightly connate at base, with a dense lanate mass surrounding the filaments and filling the mouth of receptacle. Ovary inserted at base of receptacle,

lanate-tomentose. Style pubescent throughout, equalling filaments. **Fruit** globose to ovoid, to 6 cm wide and 9 cm long; epicarp glabrous, smooth, or crustaceous-pulverulent, the surface deeply and broadly rugose when mature; mesocarp 4–7 mm thick, fibrous, hard when dry; endocarp thin, granular, fragile, glabrous and shining within.

Type: BRAZIL. AMAZONAS: *Krukoff* 6812 (fr) (holotype, F; isotypes, A BR K LE MICH MO NY RBS US).

Terra firme forest in Amazonian Brazil.

Flowering August to December.

20.X.1994 (fl) *Costa, M. A. S.* 19 (INPA K MG MO NY RB SP U); 27.XI.1957 (fr) *Coêlho, D. s.n.* (INPA5986); 22.X.1957 (fl) *Ferreira, E. & Ferreira, E.* 154 (INPA); I.XII.1997 (fl) *Hopkins, M. J. G. et al.* 1636 (IAN INPA K MO NY RB SP U); 5.X.1965 (fl) *Loureiro, A. s.n.* (INPA16139); 11.XI.1965 (fl) *Loureiro, A. s.n.* (INPA16556); 10.XI.1965 (fl) *Loureiro, A. s.n.* (INPA16566); I.I.1995 (fr) *Nascimento, J. R. & Pereira, E. C.* 733 (BM INPA K MBM MG UEC US VEN); 27.X.1994 (fr) *Sothers, C. A. et al.* 244 (INPA K MG NY SP); 23.X.1993 (fl) *Vicentini, A. & Assunção, P. A. C. L.* 377 (K).

4.22 *Licania octandra* (Hoffm. ex Roem. & Schult.) Kuntze, Rev. Gen. Pl. 217. 1891.

Hirtella octandra Hoffm. ex Roem. & Schult., L. Syst. veg. ed. 9. 5: 274. 1819.

Small to medium-sized **trees**. **Bark** with abundant longitudinal fissures, brittle and crumbling, with frequent hoop marks. Inner bark brown, no exudate. Twigs glabrous. **Leaves** elliptic to oblong-lanceolate, 3–12 × 2–4 cm, acuminate at apex, with acumen 5–13 mm long, rounded to subcuneate at base, glabrous and shining above, with well developed stomatal cavities beneath, with venation flattened around small slit-like apertures to the cavities, the mouth of the cavities glabrous to lanate; midrib prominulous above, glabrous; primary veins 8–13 pairs, prominent on lower surface, plane or nearly so above; petioles tomentose, becoming less so with age, terete or rarely shallowly canaliculate, with two sessile glands at or near junction with lower surface of lamina, the glands often obscured by pubescence. Stipules linear, to 5 mm long, membraneous, hirsutulous,

subpersistent, on young branches only. **Inflorescences** racemose panicles, the rachis and branches sparsely gray-brown-tomentose or arachnoid-pubescent. **Flowers** 2–3 mm long, sessile or nearly so on primary branches of inflorescence, solitary or in small groups. Bracts and bracteoles 1–4 mm long, persistent, tomentose on exterior, often serrate, with stipitate glands. Calyx lobes acute, tomentose on both surfaces. Receptacle campanulate, sessile or with short pedicels to 0.2 mm long, tomentose on exterior, densely villous within. Petals absent. Stamens 8–12, inserted in a complete circle; filaments far exceeding calyx lobes, free to base, glabrous. Ovary inserted at base of receptacle, villous. Style villous at base only, upper portion glabrous, equalling filaments. **Fruit** globose to elongate-lanceolate, to 2.5 cm long; epicarp glabrous; mesocarp thin and fleshy; endocarp hard, thin, fibrous, glabrous or sparsely hirsute when young within.

Only variety *pallida* of this species is known in Reserva Ducke. The typical variety occurs in Venezuela, the Guianas, eastern Amazonia and eastern and central Brazil.

Licania octandra subsp. *pallida* (Hook. f.) Prance, Fl. Neotrop. 9: 84. 1972.

Moquilea pallida Hook. f., in Mart. Fl. bras. 14(2): 25. 1867.

Type: VENEZUELA. AMAZONAS: Spruce 3302 (fl) (holotype K; isotypes BM BR CGE GH GOET LDLEPOXFRB).

Terra firme forest in western and central Amazonia.

11.VI.1997 (fr) Assunção, P.A. C. L. et al. 519 (INPAK MGMONYR RB SPU); 1.VII.1993 (fr) Ribeiro, J. E. L. S. et al. 963 (INPAK MGMONYR RB SPU); 6.IV.1994 (fl) Ribeiro, J. E. L. S. et al. 1253 (INPAK MGMONYR RB SPU); 21.VII.1994 (fl) Ribeiro, J. E. L. S. et al. 1348 (INPAK MGMONYR RB SPU); 6.V.1995 (fl) Sothers, C. A. & Pereira, E. C. 425 (INPAK MGMONYR RB SPU); 6.V.1995 (fl) Sothers, C. A. & Pereira, E. C. 430 (INPAK MGMONYR RB SPU); VIII.1905 (fl) Sothers, C. A. et al. 438 (INPAK MGMONYR RB SPU); 8.V.1995 (fl) Sothers, C. A. et al. 439 (INPAK MGMONYR RB SPU); 31.III.2000 (fr) Tree number et al. 5420 (INPA); 13.VII.1994 (fl) Vicentini, A. & Assunção, P.A. C. L. 607 (INPAK MGMONYR RB SPU).

4.23 *Licania pallida* Spruce ex Sagot, Ann. Sci. Nat., Bot. Ser. 6, 15: 306. 1883 pro parte quoad *L. parviflora* Benth. var. *pallida* tantum.

Trees to 30 m, not buttressed. **Bark** with shallow longitudinal fissures; inner bark dark red, with red exudate. Twigs glabrous and lenticellate. **Leaves** oblong-elliptic, coriaceous, 5–13 × 2–6.5 cm, the apex with a finely pointed acumen 6–15 mm long, rounded-subcuneate at base, glabrous on upper surface; lower surface with well developed stomatal cavities filled with lanate pubescence, the reticulation glabrescent and cavities conspicuous with 2 glands at base of lamina beneath; midrib plane above, or slightly impressed toward base, glabrous; primary veins 7–10 pairs, prominent below, more or less plane above; petioles 5–7 mm long, glabrescent, eglandular, rugose, usually shallowly canaliculate. Stipules 2–3 mm long, linear, coriaceous, subpersistent, adnate to extreme base of petiole. **Inflorescences** terminal and axillary branched panicles, the rachis and branches slender, puberulous. **Flowers** 1.5–2 mm long, usually on long slender peduncles attached to primary branches of inflorescence, rarely almost sessile on branches of inflorescence. Bracts and bracteoles persistent, 0.2–1 mm long, puberulous. Receptacle campanulate, tomentellous on exterior, tomentellous to puberulous within; pedicels ca. 0.25 mm long. Calyx lobes acute, puberulous on both surfaces. Petals absent. Stamens 3–5, unilateral; filaments shorter than calyx lobes, glabrous, free to base. Ovary inserted at base of receptacle, tomentose. Style equalling filaments, sparsely pubescent throughout. **Fruit** oblong; epicarp with short sordid reddish-brown pulverulent pubescence; pericarp thin, hard, fibrous, sparsely hirsutulous within.

Type: BRAZIL. AMAZONAS: Spruce 1576 (fl) (lectotype P; isotypes BR CGE F K L E M N Y O X F).

Terra firme forest in Venezuela and Brazilian Amazonia.

30.IX.1994 (fl) Ribeiro, J. E. L. S. et al. 1449 (INPAK MGMONYR RB SPU); 2.X.1964 (fl) Rodrigues, W. & Monteiro, O. P. 6743 (INPA); 20.V.1965 (fr) Rodrigues, W. & Monteiro, O. P. 6941 (INPA); 3.III.1967 (fr) Rodrigues, W. & Monteiro, O. P. 8319 (INPA); 20.IX.1968 (fl) Souza, J. A. 166 (INPA); 3.X.1968 (fl) Souza, J. A. & Coêlho, L. 205 (INPA).

25. *Licania prismatocarpa* Spruce ex Hook. f., in Mart. Fl. bras. 14(2); 19. 1867.

Trees to 25 m tall, often with stilt roots at the base, the young branches hispid-tomentellous, glabrescent. Leaves oblong-elliptic, 5–11 × 3–7 cm, retuse, rounded or shortly apiculate at apex, rounded to subcuneate at base, with few stiff appressed hairs on veins and margins, otherwise glabrous beneath, glabrous above; midrib prominulous above, with few sparse appressed hairs above, sparsely pubescent beneath; primary veins 6–9 pairs, slightly impressed above when dry, prominent beneath, secondary venation conspicuously reticulate; petioles 3–6 mm long, terete, appressed tomentellous and hirsute, eglandular. Stipules axillary, eglandular, ovate, 1–2 mm long, persistent. Inflorescences terminal and subterminal axillary panicles by short peduncles, the rachis and branches shortly tomentellous. Bracts and bracteoles minute, 0.5 mm, membranous, subsistent. Receptacle campanulate, puberulous on exterior, tomentose within. Calyx lobes acute, puberulous on both surfaces. Petals 5, pubescent on both surfaces. Stamens 5–7, inserted in a complete circle, filaments shorter than calyx-lobes, free to base. Ovary inserted at base of receptacle, lanate-pubescent. Style arising to base of anthers, pubescent. Fruit oblong, ca. 3 cm long, 2 cm broad; epicarp smooth, glabrous, markedly angled when young and slightly angled when mature and dry; mesocarp ca. 1 mm thick; endocarp very thin, bony, glabrous within.

Type: BRAZIL. AMAZONAS: Spruce 3490 (fr) (holotype K; isotypes BR CGE GHL D LENY OXF P). 29.IV.1997 (fr) Assunção, P.A. C. L. et al. 498 (GINPAK MBM MG UB US); 8.XII.1994 (fl) Hopkins, M. J. G. et al. 1511 (BM IAN INPA K SPF UEC VEN); 6.VII.1994 (fr) Nascimento, J. R. et al. 526 (INPA K); 4.VI.1993 (fr) Ribeiro, J. E. L. S. et al. 828 (INPA K MG NY SP); 2.VII.1993 (fr) Ribeiro, J. E. L. S. et al. 977 (INPA K MG MORR B U); 29.X.1996 (fl) Solters, C. A. & Pereira, E. C. 925 (G IAN INPA K MBMR U UB US); 8.XII.1994 (fl) Vicentini, A. et al. 799 (INPA K MG MONY RB SP). Other material examined: BRAZIL: AMAZONAS: Município de Manaus, Distrito Agropecuário, Fazenda Porto Alegre 02°22'S; 59°57'W Reserve 3304, Dick 107 fr (INPA 175176).

This species was placed in synonymy in Prance (1972) because with the inadequate material then available it seemed to merge with *Licania heteromorpha*. However field work at both Reserva Ducke and the Projeto Dinâmica Biológica de Fragmentos Florestais about 64 km north of Ducke has shown that this species can be easily distinguished from *L. heteromorpha* var. *heteromorpha*. It differs in the inflorescence with the flowers grouped into cymules, in the more prominent reticulation of the leaf venation on both surfaces, but especially beneath, in the slightly impressed primary veins, and in the glabrous, oblong fruit with light ridges when mature. In *L. heteromorpha* var. *heteromorpha* the fruit is globose and often pubescent. It is only ridged in var. *glabra* which does not occur in the Manaus region. *L. prismatocarpa* is more closely related to *L. reticulata* than to *L. heteromorpha*. Since this complex of species around *L. heteromorpha* is difficult to distinguish and because changes are being made to the taxonomy of Prance (1972), Table 2 is given to separate these species.

4.25 *Licania reticulata* Prance, Fl. Neotrop. 9: 97. 1972.

Trees to 25 m tall, with low thick buttresses to 30 cm. Bark brown, crumbling, wrinkled because of numerous parallel small fissures ca. 1 mm deep and 3 mm apart; outer bark thin, ± 1 mm; inner bark dark red with red exudate on outside and next to wood, 2.5 mm thick; wood white. Twigs glabrous, lenticellate. Leaves oblong-elliptic or oblong, coriaceous, 12–24 × 4.5–10 cm, rounded to subcuneate at base; apex acuminate, the acumen 2–5 mm long, glabrous and distinctly reticulate on both surfaces; midrib plane, glabrous above; primary veins 10–13 pairs, prominent on both surfaces; petioles 7–12 mm long, glabrous, terete, with two glands beneath at junction with lamina. Stipules membranous, lanceolate 2 mm long, axillary, caducous. Inflorescence of terminal panicles, flowers borne in few-flowered cymules in primary branches, the rachis lenticellate, rachis and branches sparsely puberulous. Bracts and bracteoles ca. 1 mm long, ovate, caducous.

Receptacle campanulate, puberulous on exterior, tomentellous within; pedicels 0.25–1.5 mm long. Calyx lobes acute, puberulous on both surfaces. Petals 5, sparsely pubescent. Stamens 6–7, inserted around complete circle; filaments pubescent, connate for half of length, equalling calyx lobes. Ovary sparsely villous. Style equalling calyx lobes, lanate-pubescent. **Fruit** oblong, to 7 cm long; exocarp smooth, glabrous, longitudinally costate; mesocarp thin, fleshy; endocarp thin, hard, glabrous within.

Type: BRAZIL. AMAZONAS: Manaus, (fl) (holotype NY; isotypes IAN INPA4141).

Terra firme and periodically flooded forest in Amazonian Peru and Brazil.

23.XI.1993 (fr) *Ribeiro, J. E. L. S. et al. 1168* (INPA KMG MONY RB SP); 19.I.1996 (fr) *Sothers, C. A. & Pereira, E. C. 775* (G INPA K MG R U UB US); 7.VIII.1996 (fl) *Sothers, C. A. & Assunção, P. A. C. L. 882* (INPA KMG MONY RB SP); 12.VIII.1995 (fl) *Souza, M. A. D. & Assunção, P. A. C. L. 82* (BM G INPA K MBM MG UB UEC US).

4.26 *Licania rodriguesii* Prance, Fl. Neotrop. 9: 169. 1972.

Large trees. Twigs puberulous when young, soon becoming glabrous and lenticellate. **Leaves** elliptic to oblong, coriaceous, 9–16 × 3–7 cm, subcuneate at base, apex acuminate, the acumen 8–15 mm long often subfalcate, glabrous above, densely lanate pubescent beneath; midrib glabrous and prominent above; primary veins 6–7 pairs, prominent beneath, plane and arcuate above; petioles 6–12 mm long, glabrescent, terete or slightly canaliculate, eglandular. Stipules linear, glabrous, subsistent axillary. **Inflorescence** in terminal and axillary racemose panicles, the rachis and branches tomentellous or puberulous. Bracts and bracteoles 0.5–1.5 mm long, ovate, persistent, puberulous on exterior. Receptacle campanulate, sessile, tomentellous on exterior, tomentose within. Calyx lobes acute, tomentellous on both surfaces. Petals absent. Stamens 5, unilateral, filaments glabrous, free to base, included. Ovary tomentose. Style shorter than calyx lobes, pubescent to apex. **Fruit** exocarp rufous-velutinous tomentellous when young; pericarp thin, hard, fibrous, hirsutulous within.

Type: BRAZIL. PARÁ: Breves, *Ducke s.n.* (fl) (holotype K; isotype RB 18812).

Terra firme forest in Brazilian Amazonia. Flowering June to September.

11.VI.1997 (fl) *Assunção, P. A. C. L. et al. 518* (INPA KMG MONY RB SP U); 11.VI.1997 (fl) *Assunção, P. A. C. L. et al. 521* (BM G INPA K MBM MG UB UEC US); 20.II.1998 (fr) *Assunção, P. A. C. L. et al. 799* (IAN INPA K MONY RB SP U UB); 9.VI.1965 (fl) *Rodrigues, W. & Monteiro, O. P. 7113* (INPA); 6.V.1966 (fr) *Rodrigues, W. & Coêlho, D. 7806* (INPA).

4.27 *Licania sandwithii* Prance, Fl. Neotrop. 9: 142. 1972.

Large trees, the young branches rufous-hirsutulous soon becoming glabrous and lenticellate. **Leaves** thickly coriaceous, ovate-orbicular, 6–11.5 × 4–7.5 cm broad; rounded to acute at apex, rounded at base, glabrous and shiny above, lanate-farinaceous pubescent and deeply reticulate beneath; midrib slightly impressed, hirsutulous on basal portion above, hirsutulous beneath, primary veins 7–9 pairs, impressed and glabrous above, prominent and hirsutulous beneath; petioles 4–5 mm long, densely hirsutulous, terete, eglandular. Stipules elliptic, 3–5 mm long, hirsutulous, persistent, intrapetiolar. **Inflorescences** terminal and axillary racemose panicles, the rachis and branches rufous-tomentose; bracts and bracteoles ovate, to 3 mm long, persistent, tomentose on exterior. **Flowers** 3.5–5 mm long, sessile; receptacle broadly cupuliform, densely rufous tomentose on both surfaces; calyx lobes acute, tomentose on both surfaces; petals absent; stamens 6–8, unilateral, the filaments free to base, glabrous, shorter than calyx lobes; ovary villous, style villous, shorter than calyx lobes. **Fruit** not seen.

Type: GUYANA. *R. Boyan 92 = FD7916* (holotype NY).

Known from Mazaruni River region of Guyana, and the vicinity of Manaus in forest on terra firme.

17.I.1995 (fl) *Assunção, P. A. C. L. 152* (INPA KMG MONY RB SP U); 21.IX.1997 (fl) *Assunção, P. A. C. L. et al. 677* (BM G IAN INPA K MBM UB US); 23.XII.1997 (fl) *Assunção, P. A. C. L. et al. 764* (INPA K MG MONY RB SP U); 26.XI.1993 (fl) *Ribeiro, J. E. L. S. et al. 1193* (FINPAMGMOMTNYPRRBSPUECVEN).

4.28 *Licania sothersiae* Prance, Novon 11: 328. 2001. **Fig. 2**

Trees to 20 m tall, the young branches puberulous, glabrescent, with narrowly-oblong lenticels. **Leaves** oblong-elliptic, 5.5–11 × 3–6 cm, retuse at apex, cuneate at base, glabrous above, glabrous beneath except for very few stiff appressed hairs on midrib and primary veins; midrib prominulous above, with few sparse appressed hairs on both surfaces; primary veins 6–7 pairs, prominulous above, prominent beneath, secondary venation conspicuously reticulate beneath; petioles 8–13 mm long, terete, with two prominent subopposite glands on middle, sparsely hirsutulous. Stipules lanceolate, axillary, 5–6 mm long, membranous, caducous. **Inflorescences** of terminal and subterminal panicles of racemes, the **flowers** sessile on primary branches and not grouped into cymules, the rachis and branches shortly appressed tomentellous. Bracts and bracteoles minute, 0.5–1 mm long, lanceolate, membranous, persistent. Receptacle campanulate, puberulous on exterior, tomentose within. Calyx lobes acute, puberulous on both surfaces. Stamens 6–7, inserted in a complete circle, filaments shorter than calyx lobes; free or united? Ovary inserted at base of receptacle, lanate pubescent. **Style** arising to base of anthers, pubescent. **Fruit** not seen. **Type:** J. E. L. S. Ribeiro 1142 (holotype INPA178370; isotypes K MG MO NY RB SP).

26.III.1997 (fr) Ribeiro, J. E. L. S. & Pereira, E. C. 1878 (INPA K MG MO NY R RB SP U); 16.XII.1996 (fr) Sothers, C. A. & Silva, C. F. 959 (G INPA K MG UB).

This is another taxon resulting in the split up of the *L. heteromorpha* complex. It differs from *L. heteromorpha* and *L. prismatocarpa* as re-defined in the much larger petioles with two prominent median glands, and from *L. risuatocarpa* also in the inflorescence with flowers borne directly on primary branches.

4.29 *Licania sprucei* (Hook. f.) Fritsch, Ann. K. K. Naturhist. Hofmus. 4: 55. 1889.

Moquilea sprucei Hooker f., *in* Mart. Fl. bras. 14(2): 22, t. 6. 1867.

Small to medium-sized **tree** to 20 m tall. **Twigs** glabrous or puberulous. **Leaves** oblong

to oblong-elliptic, thick-coriaceous, 6–20 × 2.5–6.5 cm, acuminate at apex, with acumen 4–15 mm long, rounded to subcuneate at base, the upper surface glabrous, well developed stomatal cavities on lower surface, venation plane, with slit-like apertures to cavities filled with lanate pubescence; midrib prominent above, glabrous; primary veins 9–11 pairs, prominent below; petioles 6–10 mm long, sparsely puberulous, becoming glabrous, terete to shallowly canaliculate, rugose, with two glands on upper surface at base of lamina. Stipules caducous (not seen). **Inflorescences** terminal and axillary panicles, the rachis and branches sparsely puberulous. **Flowers** ca. 3 mm long, in small cymules on short secondary inflorescence branches 2–5 mm long. Bracts and bracteoles ca. 1 mm long, ovate, persistent, serrate, often with stipitate glands. Receptacle campanulate, puberulous on exterior, villous-tomentose within; pedicels ca. 0.5 mm long. Calyx lobes acute, puberulous on both surfaces. Petals absent. Stamens 10, inserted in a complete circle; filaments exceeding calyx lobes, free almost to base, glabrous. Ovary inserted at base of receptacle, villous. Style villous for most of length, equalling filaments. **Fruit** globose; exterior smooth, glabrous, drying black; mesocarp thin, fleshy; endocarp thin, fibrous, puberulous within.

Type: BRAZIL. AMAZONAS: *Spruce 1801* (fl) (holotype K; isotypes BM CGE GH GOET LD LE MNYP).

Primary forest on terra firme and secondary forest in southern Guyana and in the Manaus region of Brazil. Flowering June to October. 30.VI.1993 (fl) Ribeiro, J. E. L. S. et al. 935 (INPA K MG); 4.VII.1993 (fl) Ribeiro, J. E. L. S. et al. 1005 (INPA K MG MO NY R RB SP U); 12.X.1995 (fl) Ribeiro, J. E. L. S. et al. 1735 (G IAN INPA K UB US); 25.I.1996 (fr) Souza, M. A. D. et al. 212 (INPA K MG MO NY R RB SP U); 18.VII.1997 (fl) Souza, M. A. D. et al. 378 (INPA K MG MO NY R RB SP U).

4.30 *Licania unguiculata* Prance, Fl. Neotrop. 9: 60. 1972.

Large **trees** to 40 m tall, without buttresses. **Bark** grey-brown with shallow vertical fissures 4–8 cm apart, 1–2 mm deep

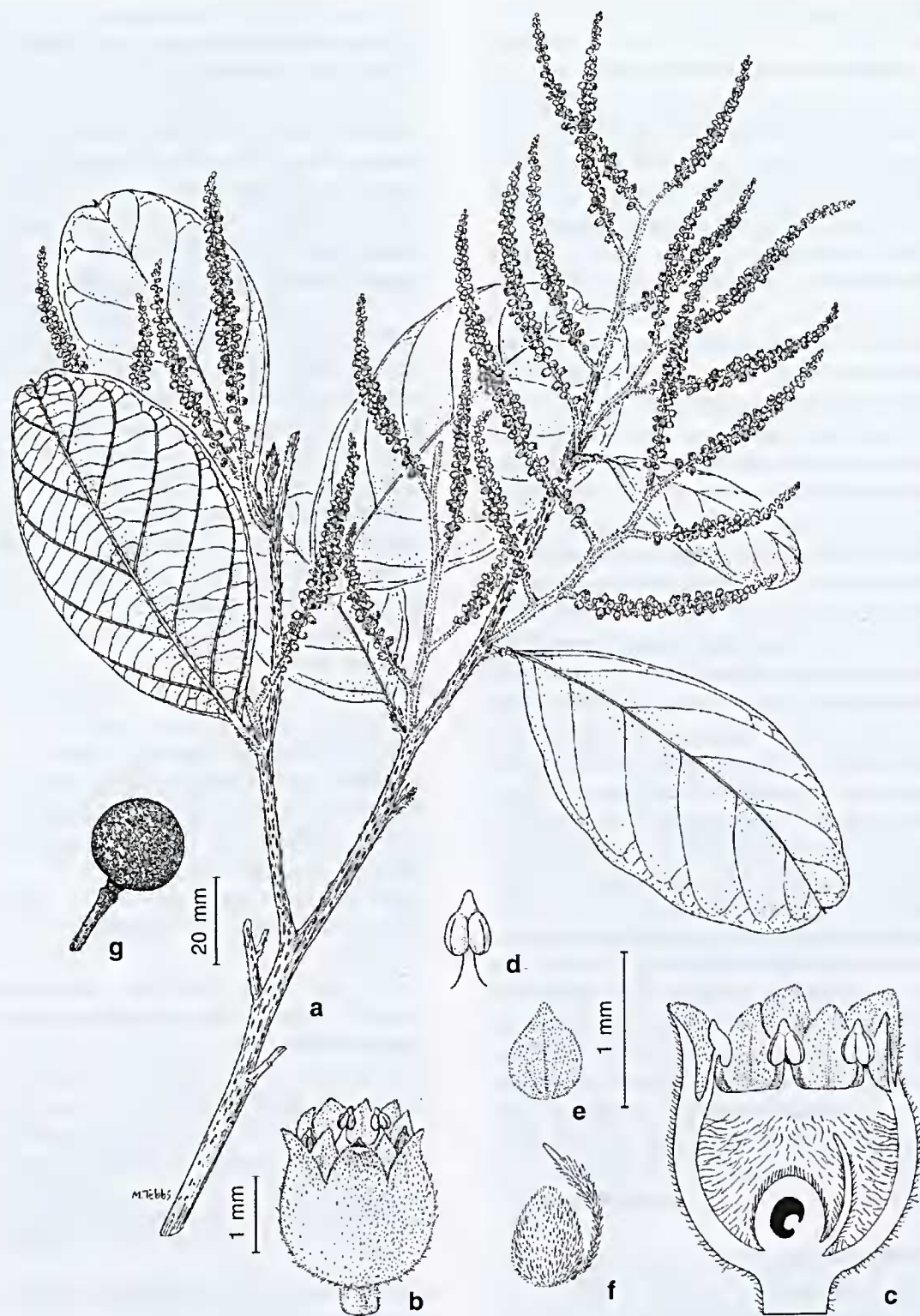


Figure 2 - *Licania sothersiae* - a. hábito; b. flor; c. flor em corte transversal; d. estame; e. pétala; f. ovário; g. fruto; (a Ribeiro 1142; b-g Ribeiro & Pereira 1848). Desenhado por Margaret Tebbs (a & g) e J.M.Fothergill (b-f).

giving wrinkled appearance; outer bark thin, \pm 1 mm; inner bark pale brown oxidising reddish, with clear watery sap; wood yellow smelling of beans. Twigs puberulous soon becoming glabrous, lenticellate. **Leaves** ovate to elliptic, coriaceous, 5.5–15 \times 3.5–6.8 cm, rounded to subcuneate at base, apex acuminate, the acumen 3–15 mm long, glabrous on both surfaces; midrib prominent above; primary veins 7–10 pairs, prominent beneath, prominulous above; petioles 2–5 mm long, terete, glabrous, with 2 glands on lower side. Stipules axillary, 2–4 mm long, lanceolate, membranous, persistent. **Inflorescence** of terminal and subterminal racemose panicles, the rachis and branches puberulous. Bracts and bracteoles 0.3–1 mm long, persistent, puberulous on exterior. Receptacle campanulate, tomentellous on exterior, densely tomentose within; pedicels 2–2.5 mm long. Calyx lobes acute, tomentellous on both surfaces. Petals 5, unguiculate, exceeding calyx lobes, pubescent. Stamens *ca.* 14, inserted around complete circle; filaments slightly exceeding calyx lobes, glabrous, united at extreme base only. Ovary villous-tomentose. Style hirsute to apex, equalling stamens. **Fruit** elongate-cylindrical, exocarp smooth, pericarp fibrous, glabrous within.

Type: BRAZIL. Rio Negro, above mouth of Rio Curicuriari, *Ducke s.n.* (fl) (holotype K; isotype, RB23599).

Terra firme forest in western and central Amazonian Brazil. Flowering October to December. 30.VIII.1995 (fl) *Assunção, P. A. C. L. & Souza, M. A. D.* 238 (BM G IAN INPA K MBM UB UEC US); 25.VII.1997 (fl) *Assunção, P. A. C. L. et al.* 571 (INPA K MG MONY RRB SP U); 3.X.1957 (fl) *Ferreira, E. & Ferreira, E.* 131 (INPA); 25.XI.1995 (fr) *Sothers, C. A. et al.* 686 (INPA K MG NY SP); 13.X.1994 (fl) *Vicentini, A. et al.* 746 (INPA K MG MONY RRB SP U).

5. *Parinari*

Parinari Aubl., Pl. Guiane 1: 514, t. 204-206. 1775.

Small to large trees or shrubs, occasionally suffrutices. **Flowers** hermaphrodite 4–8 mm long. **Leaves** entire, glabrous above with

stomatal cavities filled with lanate pubescence on lower surface. Petioles usually with two sessile glands. Bracts and bracteoles eglandular, enclosing young flowers in small groups. **Inflorescences** much branched panicles. Receptacle turbinate to campanulate, slightly swollen at one side, hollow, pubescent throughout within, tomentose on exterior. Calyx lobes 5, acute. Petals 5. Stamens 6–8; filaments not exceeding the calyx lobes, unilateral with staminodes inserted opposite them. Ovary inserted laterally at the mouth of the receptacle, the carpels bilocular. Style filiform, not exceeding the calyx lobes. **Fruit** a fleshy drupe with a verrucose epicarp; mesocarp fleshy and often fibrous; endocarp hard, thick, and with a rough fibrous surface which may be channelled, with two basal plugs or stoppers the detachment of which allows the seedling to escape. Germination hypogeal, the first leaves alternate.

Type species: *Parinari campestris* Aubl. The name *Parinari* is derived from the vernacular name in French Guiana.

Pantropical, in the American tropics from Costa Rica, Colombia through the Guianas, Amazon basin to southern Brazil and Bolivia; also in Trinidad. Two species occur in Reserva Ducke and a third, *P. montana* is likely to occur.

5.1 *Parinari excelsa* Sabinc, Trans. Hort. Soc. London 5: 451. 1824.

Trees to 40 m tall, the trunk with low thick buttresses. **Bark** with numerous prominent lenticels, not fissured, crumbling; inner bark pinkish-brown, with watery translucent clear sap only. Twigs sparsely pubescent, becoming glabrous with age. **Leaves** ovate to oblong-elliptic 3–9 \times 1.5–5 cm, rounded to cuneate at base, acuminate at apex, with acumen 2–10 mm long, glabrous above, tomentose and with stomatal cavities beneath; primary veins 13–20 pairs, prominent beneath; midrib plane to prominulous above, glabrous; petioles 3–7 mm long, pubescent when young, with two sessile medial glands (often becoming inconspicuous with age), terete. Stipules *ca.* 7 mm long, membranous, caducous.

Inflorescences terminal rather lax panicles, the rachis and branches with light brown to rufous pubescence. Receptacle subcampanulate-turbinate, tomentose on exterior, pedicels 1–2 mm long. Petals 5, white, shorter than calyx lobes. Stamens 7 fertile, unilateral with 7–8 short filamentous staminodes opposite them. Ovary and base of style pilose. **Fruit** ellipsoid, 2.5–4 cm long, 1.8–2.5 cm broad; epicarp densely verrucose; mesocarp thin and fleshy; endocarp hard and thick, the exterior granular, fibrous, and slightly ridged, densely lanate within.

Type: SIERRALEONE. *G. Don s.n.* (lectotype K).

Terra firme forest from Costa Rica and Amazonian Colombia and eastern Venezuela through the Guianas and Amazonian Brazil to eastern-central Brazil, also widespread in Africa. 8.VIII.1994 (fl) *Assunção, P. A. C. L. 36* (INPA K MG MONY RRB SPU); 29.VII.1994 (fl) *Hopkins, M. J. G. et al. 1470* (INPA K MG MONY RRB SPU); 2.IX.1994 (fl) *Nascimento, J. R. & Silva, C. F. 585* (INPA K MG MONY PR RB SPU); 2.III.1995 (fr) *Nascimento, J. R. et al. 766* (INPA K MG MONY RRB SPU); 21.VIII.1964 (fl) *Rodrigues, W. & Monteiro, O. P. 6007* (INPA); 9.IX.1968 (fl) *Souza, J. A. 153* (INPA).

5.2 *Parinari montana* Aubl. emend Ducke, *Revue Bot. Appl. Agr. Trop.* 15: 180. 1935.

Parinari montana Aubl., *Hist. Pl. Guiane* 1: 514, t. 205, 1775 *pro parte quoad fructum tantum*.

Trees to 40 m tall. Twigs pilose, becoming glabrous and lenticellate with age. **Leaves** oblong to oblong-lanceolate, 9–17 × 3–6.5 cm, cuneate to subcuneate at base, acuminate at apex, with acumen 5–9 mm long, glabrous above, tomentose and with stomatal cavities beneath; midrib impressed above, prominent beneath, lower portion pubescent; petioles 7–12 mm, terete or weakly canaliculate; with two pairs of medial, subopposite glands, tomentose when young. Stipules 1–3 mm long, caducous. **Inflorescences** terminal and axillary panicles 4.5–11 cm long, the rachis and branches short-tomentellous. Receptacle subcampanulate-turbinate, yellow-brown-tomentellous on

exterior. Petals 5, white, shorter than calyx lobes. Stamens 7 fertile, with 7–8 staminodes opposite them. Ovary and lower portion of style pilose. **Fruits** globose to oblong, up to 10 cm in diameter; epicarp densely verrucose; mesocarp thin and fleshy; endocarp hard and very thick, the exterior deeply ridged and spikey, lanate within.

Type: FRENCH GUIANA. *Aublet s.n.* (fr) (BM fruit only, not vegetative material).

Terra firme forest in French Guiana and northern Brazilian Amazonia. Flowering June to November. This species has not yet been collected in Reserva Ducke but is most likely to occur.

5.3 *Parinari parvifolia* Sandwith, *Kew Bull.* 1931: 374. 1931.

Large tree to 45 m high. Trunk with low thick buttresses. **Bark** with thin irregular longitudinal fissures, not prominently lenticellate; inner bark pinkish-brown, no exudate. Twigs villous, soon becoming glabrous and lenticellate. **Leaves** elliptic to oblong-lanceolate, 2–7.5 × 1–3 cm, stiffly coriaceous, cuneate (rarely slightly rounded) at base, acuminate at apex, with acumen 10–13 mm long; primary veins 27–30 pairs, prominent beneath, slightly impressed above; midrib slightly impressed above; petioles short, 2–5 mm long, pubescent when young, with 2 inconspicuous glands near lamina, terete. Stipules to 1 mm long, caducous. **Inflorescences** terminal and axillary panicles, the rachis and branches light-brown-tomentellous, 3–5 cm long, densely flowered. Receptacle subcampanulate-turbinate, tomentose on exterior; pedicels 1–2 mm long. Petals 5, equalling calyx lobes. Stamens 7 fertile, with 7 short filamentous staminodes opposite them. Ovary and base of style villous. **Fruit** unknown.

Types: GUYANA. *Sandwith 139* (fl) (holotype, K; isotype, NY).

Primary forests of Costa Rica, Guyana and eastern and Central Amazonia, on terra firme. 21.V.1997 (fl) *Sothers, C. A. et al. 991* (IAN INPA K MONY RRB SPU UB).

Table 3 - The species of Chrysobalanaceae known to occur in the Manaus degree square of latitude and longitude and their presence in Reserva Ducke and in the Projeto Dinâmica Biológica de Fragmentos Florestais about 64 km N of Manaus.

	PDBFF	Ducke	Distribution		PDBFF	Ducke	Distribution
<i>Chrysobanus</i>				<i>Licania</i>			
<i>venezuelanus</i>	-	+	GM	<i>adophoduckei</i>	-	+	CA
<i>Couepia</i>				<i>affinis</i>	+	-	W
<i>bracteosa</i>	+	+	AGW	<i>apetala</i>	+	+	AGW
<i>canomensis</i>	+	+	WA	<i>blackii</i>	+	-	WA
<i>chrysocalyx</i>	-	-	WA	<i>bracteata</i>	+	+	WA
<i>caryophylloides</i>	+	-	GM	<i>canescens</i>	+	+	AGW
<i>elata</i>	+	+	WA	<i>caudata</i>	+	+	AGW
<i>excelsa</i>	+	-	EA	<i>coriacea</i>	+	+	GM
<i>glabra</i>	+	-	M	<i>davillifolia</i>	+	-	EGM
<i>guianensis</i>	+	+	AGW	<i>discolor</i>	-	-	EGM
<i>habrantha</i>	+	-	AGW	<i>divaricata</i>	+	-	EGM
<i>longipendula</i>	+	+	WA	<i>egleri</i>	+	+	WA
<i>magnoliifolia</i>	+	+	CA	<i>elliptica</i>	+	-	WA
<i>morii</i>	+	-	CA	<i>fanshawei</i>	+	-	GM
<i>obovata</i>	+	+	AGW	<i>glabriflora</i>	-	-	AGW
<i>parillo</i>	-	+	AW, River.	<i>gracilipes</i>	-	+	CA, WA
<i>racemosa</i>	-	+	WA	<i>heteromorpha</i>	+	+	AGW
<i>rankinii</i>	+	-	CA	<i>hirsuta</i>	+	+	WA
<i>robusta</i>	+	+	EA	<i>hypoleuca</i>	+	+	W
<i>sandwithii</i>	+	-	GM	<i>impressa</i>	+	+	EA
<i>spicata</i>	+	-	CA	<i>irwinii</i>	+	-	GM
<i>ulei</i>	-	+	WA	<i>kunthiana</i>	+	-	W
<i>Exellodendron</i>				<i>laevigata</i>	+	+	GM
<i>barbatum</i>	-	-	EGM	<i>lata</i>	-	+	WA
<i>coriaceum</i>	-	-	EA, WA	<i>latifolia</i>	+	+	WA
<i>Hirtella</i>				<i>laxiflora</i>	+	-	GM
<i>arenosa</i>	-	-		<i>longistyla</i>	+	+	AGW
<i>bicornis</i>	+	+	AGW	<i>macrophylla</i>	-	+	EA
<i>conduplicata</i>	+	-	CA	<i>membranacea</i>	+	-	GM
<i>duckei</i>	-	+	WA	<i>micrantha</i>	+	+	W
<i>eriandra</i>	-	-	AW	<i>minutiflora</i>	+	-	AGW
<i>fasciculata</i>	-	+	M	<i>mollis</i>	-	-	WA, River.
<i>glabrata</i>	-	-	CA	<i>niloi</i>	+	+	CA
<i>hispidula</i>	+	+	AGW	<i>oblongifolia</i>	+	+	WA
<i>mucronata</i>	-	-	GM	<i>octandra</i>	+	+	WA
<i>mymecophila</i>	-	+	CA	<i>occultans</i>	+	-	CA
<i>obidensis</i>	+	-	EGM	<i>pallida</i>	+	+	AGW
<i>paniculata</i>	-	-	GM	<i>paraensis</i>	-	-	WA
<i>physophora</i>	-	+	AGW	<i>parviflora</i>	-	-	AGW
<i>piresii</i>	+	+	AGW	<i>parvifructa</i>	-	-	GM
<i>racemosa</i>	-	-	W	<i>piresii</i>	+	-	GM
<i>rodriguesii</i>	+	+	WA	<i>polita</i>	-	-	AGW
<i>suffulta</i>	+	-	EGM	<i>prismatocarpa</i>	-	-	CA
<i>tenuifolia</i>	-	-	EGM	<i>reticulata</i>	+	+	AGW
<i>triandra</i>	-	-	W	<i>robusta</i>	+	-	GM
<i>ulei</i>	-	-	WA	<i>rodriguesii</i>	+	+	EA
<i>Parinari</i>				<i>rufescens</i>	+	-	GM
<i>excelsa</i>	+	+	W	<i>sandwithii</i>	+	+	GM
<i>montana</i>	+	-	AGM	<i>savannarum</i>	-	-	WA, Savan.
<i>parvifolia</i>	+	+	EGM	<i>silvae</i>	+	-	AGM
				<i>sprucei</i>	+	+	AGM
				<i>sothersiae</i>	-	+	CA
				<i>unguiculata</i>	+	+	WA

Their general distribution is indicated by the following symbols: AGW - Amazonia, Guianas, widespread; AW - Amazonia widespread; CA - Central Amazonia only; EA - Eastern Amazonia; EGM - E Amazonia, Guianas, Manaus; GM - Guianas to Manaus; M - Manaus only; W - Widespread beyond Amazonia; WA - Western Amazonia